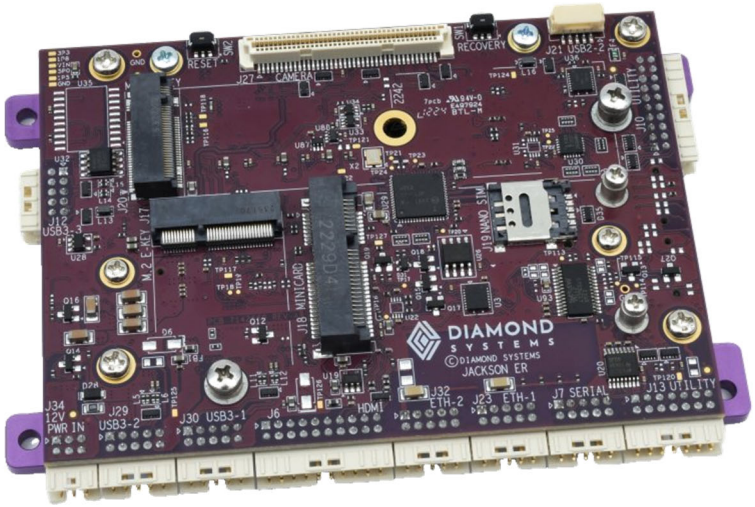
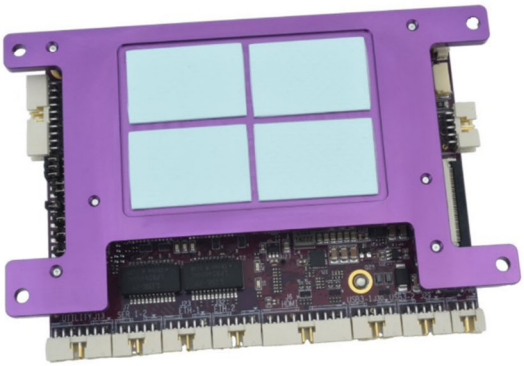
JACKSON-ER

Rugged Carrier for NVIDIA® Jetson Orin Nano & NX

User Manual rev 0.2





FOR TECHNICAL SUPPORT PLEASE CONTACT:

Email: support@diamondsystems.com

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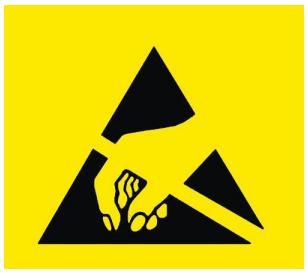
1 IMPORTANT SAFE HANDLING INFORMATION



WARNING!

ESD-Sensitive Electronic Equipment

Observe ESD-safe handling procedures when working with this product.

Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.

Always store this product in ESD-protective packaging when not in use.

Safe Handling Precautions

Diamond Systems boards are designed with complex circuitry and electronic components that are ESD-sensitive. This increases the likelihood of the boards incurring accidental damage during handling, installation, and connection to other equipment.

It is highly recommended that the following precautionary measures and best practices be observed in sequential order:

- Wear an anti-static Wristband/Strap or/and an antistatic Lab Coat or/and Rubber-soled shoes.
- Spread anti-static mats over the table or work surface or/and anti-static mats on the floor.
- Unpack components and remove them from their anti-static bags only when they are ready to be used.
- Avoid ungrounded surfaces such as plastic, carpets, floors, or tables, in the work area.
- Handle boards by the edges and their metal mounting brackets. Avoid touching components on the boards and the edge connectors that connect to expansion slots.

The following information describes common causes of failure found on boards and components returned to Diamond Systems for repair. It is provided as a guideline to avoid accidental damage. No all information here is applicable to the product described in this user manual.

ESD Damage: This type of damage is typically impossible to detect because there is no visual sign of failure or damage. In this type of damage, the board eventually stops functioning because of some defective components. Usually, the failure can be identified, and the chip can be replaced.

To prevent ESD damage, always follow proper ESD-prevention practices when handling computer boards.

Damage During Handling or Storage: Physical damage on boards also occurs due to mishandling. A common observation is that of a screwdriver slipping on the board during installation, causing a gouge on the PCB surface, cutting signal traces or damaging components.

Another common observation is damaged board corners, indicating the board was dropped. This may or may not cause damage to the circuitry, depending on components located near the edges. Most Diamond System boards are designed with a minimum 25 mils clearance between the board edge and component pad. The ground/power planes are located a minimum of 20 mils from the edge to avoid possible shorting from this type of damage. However, these design rules do not prevent damage in all situations.

Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. Though Diamond Systems boards are resilient to damages, the components located close to the board edges can be damaged or even knocked off the board if the board lies tilted in the rack.

Diamond Systems recommends that all its boards be stored only in individual ESD-safe packaging units. If multiple boards are stored together, they should be contained in bins with dividers placed between the boards. Do not pile boards on top of each other or cram too many boards within a small location. This can cause damage to connector pins or fragile components.

Bent Connector Pins: This type of problem can be resolved by re-bending the pins to their original shape using needle-nose pliers.

The most common cause of a bent connector pin is when the board is pulled off a stack by tugging it at angles from one end of the connector to the other, in an effort to release it off the stack. Tugging the board off the stack in this manner can bend the pin(s) significantly.

A similar situation can occur when pulling a ribbon cable off a pin header. If the pins are bent too severely, bending them back can cause them to weaken or break. In this case, the connector must be replaced.

Power Damages: There are various causes of power-specific damages that can occur while handling the board. Some common causes such as –a metal screwdriver tip slipping, or a screw dropping onto the board while it is powered-up, causes a short between a power pin and a signal pin on a component.

These faults can cause over-voltage/power supply problems besides other causes described below.

To avoid such damages, assembly operations must be performed when the system is powered off.

Power Supply Wired Backwards: Diamond Systems power supplies and boards are not designed to withstand a reverse power supply connection. This will destroy almost all ICs connected to the power supply. In this case, the board will likely be irreparable and must be replaced. A chip destroyed by reverse or excessive power will often have a visible hole or show some deformation on the surface due to vaporization inside the package.

Overvoltage on Analog Input: If a voltage applied to an analog input exceeds the power specification of the board, the input multiplexer and/or parts behind it can be damaged. Most Diamond Systems boards will withstand an erroneous connection of up to 36V on the analog inputs, even when the board is powered off, but not on all boards, and not under all conditions.

Overvoltage on Analog Output: If an Analog output is accidentally connected to another output signal or a power supply voltage, the output can be damaged. On most Diamond boards, a short circuit to ground on an analog output will deter any damage to the board.

Overvoltage on Digital I/O Line: If a Digital I/O signal is connected to a voltage above the maximum specified voltage, the digital circuitry can be damaged. The acceptable voltage range on most Diamond Systems boards connected to digital I/O signals is 0-5V, with overvoltage protection up to 5.5V (-0.5 to 5.5V). Overvoltage beyond this limit can damage the circuitry.

Other considerations are Logic Signals, which are typically generated between 12V to 24V.

If a Digital I/O Line of 12V to 24V is connected to a 5V logic chip, the chip will be damaged, and the damage could extend to other chips in the circuit.

IMPORTANT! Always check twice before Powering Up!

2 INTRODUCTION

2.1 Jackson ER Product Overview

Jackson ER is an Orin Nano / Orin NX carrier designed for rugged applications, featuring improved resistance to shock and vibration, improved heat dissipation, and full temperature range compatibility with installed Jetson Orin modules. Jackson-ER converts the Orin module into a complete embedded system by providing interface circuitry, I/O connectors for all the major features of the module, camera interface, power supply and additional I/O capabilities.

Jackson-ER contains multiple expansion sockets to support M.2 SSD, M.2 E-key modem, PCIe minicard I/O, a camera adapter connector to support CSI and GMSL cameras, and a daughterboard expansion connector.

Jackson ER Features

Feature	*Description*	*Connector Type*
Power	7V-20V wide input supply	2x3 connector (J34)
RTC	3V power input for RTC functionality	1x2 connector (J35)
Ethernet	1x 10/100/1000Mbps from the Orin NX/ Nano module	2x5 connector (J23)
	*1x 10/100/1000Mbps from the I210 controller	2x5 connector (J32)
Mass Storage	1 Minicard expansion with x1 PCIe and x1 USB2.0 with SIM connector	PCIe Minicard 52 Position (52-Pin-Surface Mount, Right Angle) (J18)
	1 M.2 M Key (2280 or 2242) (NVMe) expansion slots (4 lane PCIe Gen 3)	M.2 (Key M) Socket (J20)
	1 M.2 E key 2230	67 Position Female M.2 Connector (Surface Mount, Right Angle) (J17)
Expansion Connector	*1x USB3.2, 1x USB2.0 and PCIe x1 lane expansion	Signal Terminated to 40 Position Connector FFC (J9)
USB	2x USB 3.2 / USB 2.0	2x5 connector (J29) 2x5 connector (J30)
	1x USB2.0	1x5 connector (J21)
	*1x USB3.2 / USB2.0	2x5 connector (J12)
Serial Ports	1x port that is jumper configurable RS-232/485/422	2x5 connector (J7)
	1x RS232 through MAX232	2x5 connector (J7)
Display	1x HDMI 2.0a/b directly from the module with audio	2x10 connector (J6)
Camera	2x 4 lane CSI-2 Camera Interface	80 pin B2B Connector (J27)
Digital I/O	8x Digital IO 3.3V/5V via I2C GPIO expander, I2C, SPI.	2x10 Header (J10)
CAN	1x CAN interface	1x4 SMD connector (J14)
Fan	1x Fan connector to support active thermal solution	1x4 SMD connector (J15)
Utility	8x Digital IO 3.3V/5V realized using I2C GPIO expander. Force Recovery, PWR_BTN, Reset, Debug UART	2x7 Header (J13)
Operating System Support		
Linux Kernel version 4.9; Ubuntu 20.04		
Mechanical, Electrical and Environmental Properties		
Form-Factor	80mm x 110mm	
Cooling Mechanism	Conduction Cooling and Active Cooling (Different Variants available)	
Power Input Range	+7 to +20VDC, +12V Typical	
Operating Temperature Range	-25°C to +80°C ambient	
RoHS	Compliant	

*1x Ethernet (from I210) and 1x USB3.2 / USB2.0 (on 2x10 header) will be not supported when expansion cards are used.

2.2 Jackson ER Ordering Guide

The table below lists the current and planned part numbers in the Jackson ER product family. Additional models and part numbers may be added from time to time.

JAXER-BB01	Jackson-ER Baseboard (no Jetson module or heat spreader)
JAXER-ASY-ONX16-HSP	Jackson-ER assembly with Orin NX 16GB module and heat spreader;Linux OS installed
JAXER-ASY-ONA8-HSP	Jackson-ER assembly with Orin Nano 8GB module and heat spreader;Linux OS installed
JAXER-ASY-ONX16-HSK	Jackson-ER assembly with Orin NX 16GB module and fan sink; Linux OS installed
JAXER-ASY-ONA8-HSK	Jackson-ER assembly with Orin Nano 8GB module and fan sink; Linux OS installed
6882660	Heat spreader for Jackson-ER, with thermal pads and installation hardware

The below table lists the components included in the Jackson ER assemblies based on the JAXER-BB01 carrier board:

DSC Part Number	Jetson Module	NVMe SSD	Thermal Solution	OS
JAXER-ASY-ONX16-HSP	Orin NX 16GB Module	M.2 2280 NVMe x4 128GB 3D TLC	Heat Spreader	OS Image, Linux for Orin NX
JAXER-ASY-ONA8-HSP	Orin NX 8GB Module	M.2 2280 NVMe x4 128GB 3D TLC	Heat Spreader	OS Image, Linux for Orin NX
JAXER-ASY-ONX16-HSK	Orin NX 16GB Module	M.2 2280 NVMe x4 128GB 3D TLC	Heat Sink with Fan	OS Image, Linux for Orin NX
JAXER-ASY-ONA8-HSK	Orin NX 8GB Module	M.2 2280 NVMe x4 128GB 3D TLC	Heat Sink with Fan	OS Image, Linux for Orin NX

The table below lists the part numbers for supported accessories used with Jackson ER.

6882650	Heat sink for Jackson / Jackson-ER, 90 x 50.3 x 21.5mm
6882651	Heat sink with fan for Jackson / Jackson-ER, 90 x 50.3 x 25.6mm, 5V fan power
CK-JAXER-01	Cable kit for Jackson-ER

Cable kit CK-JAXER-01 includes the following cables:

Cable no.	Qty	Description
6980504	1	USB cable, JST GHV-05V-S latching to USB type A panel mount, 12"
6980529	1	Cable, Molex 51021-0200 1.25mm Pitch, 150mm L, External Battery
6980601	1	Cable, Dual Serial Port, FCI 98414 to 2x DB9M, 12"L
6980603	1	Cable, FCI 2x5 2mm latching to USB 3.0 type A panel mount
6980604	2	Cable, Ethernet, Latching 2x5 2mm to RJ-45 Socket Panel Moun, 12"L
6980605	1	Cable, HDMI, Latching 2x10 2mm to HDMI Panel Moun 12"L
6980607	1	Utility I/O cable, 2x10 latching to 2x10 2mm IDC ribbon
6980613	1	Power input cable, FCI 2x3 2mm latching to tinned leads
6980614	1	Utility cable, FCI latching 2x7 2mm to IDC 2mm 2x7 socket header
6981182	1	CANbus 2.0 cable, JST 1x4 to DB9M

The table below lists the software support for Jackson ER product.

8512651	OS Image, Jackson ER, Linux for Orin Nano 4GB/8GB
8512650	OS Image, Jackson ER, Linux for Orin NX 8/16GB

2.3 Product Photos

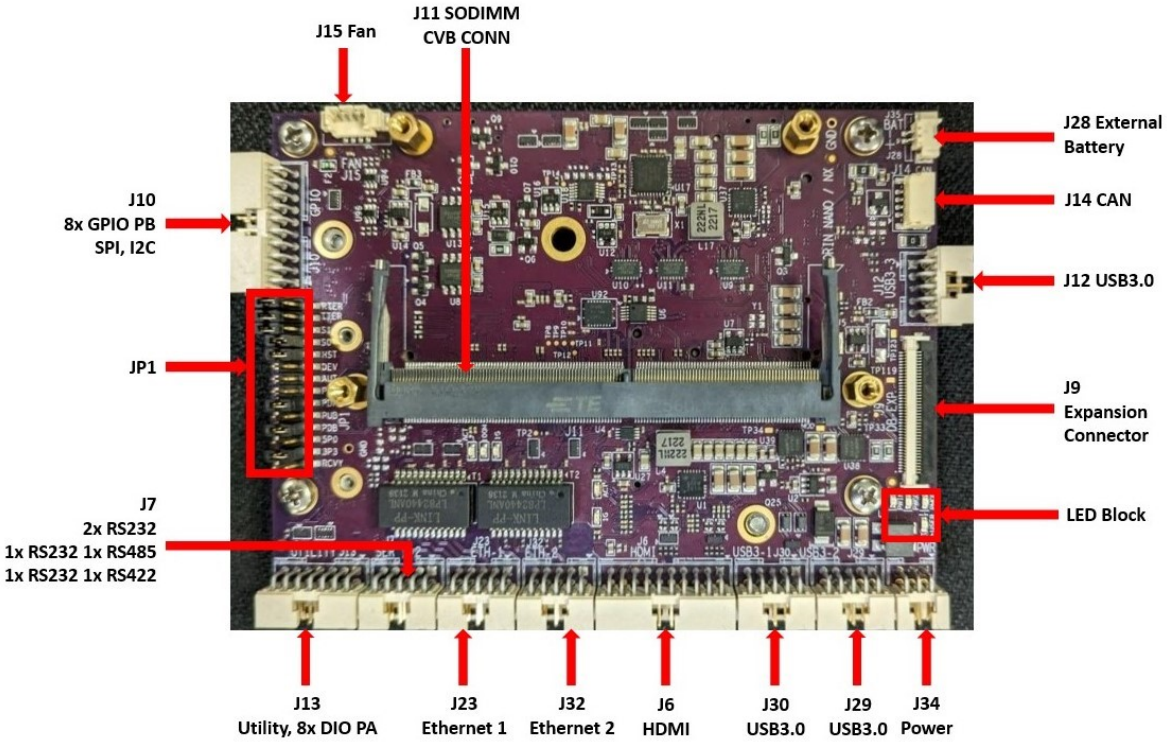


Figure 2-1: Jackson ER top side

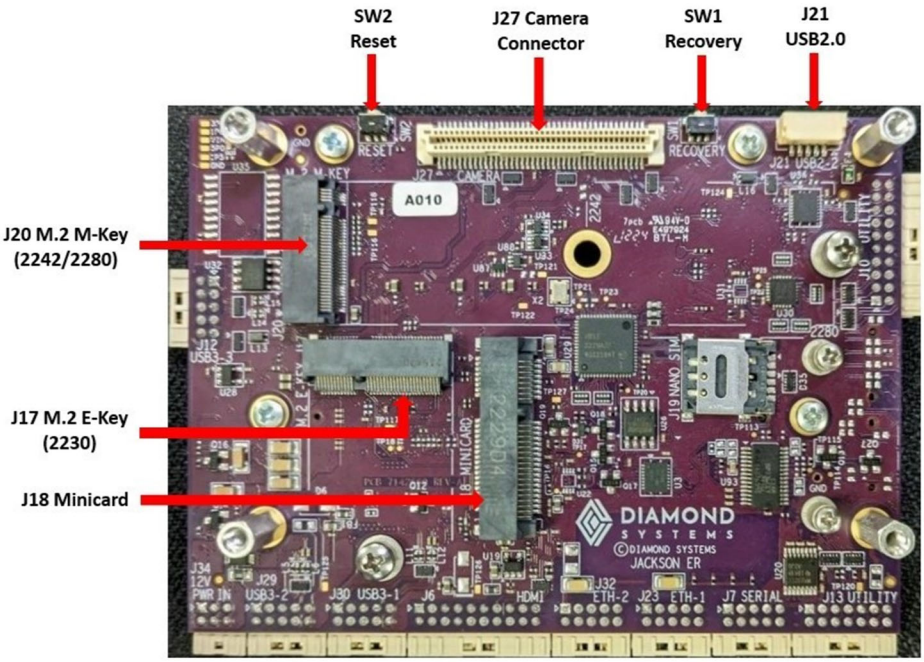


Figure 2-2: Jackson ER bottom side

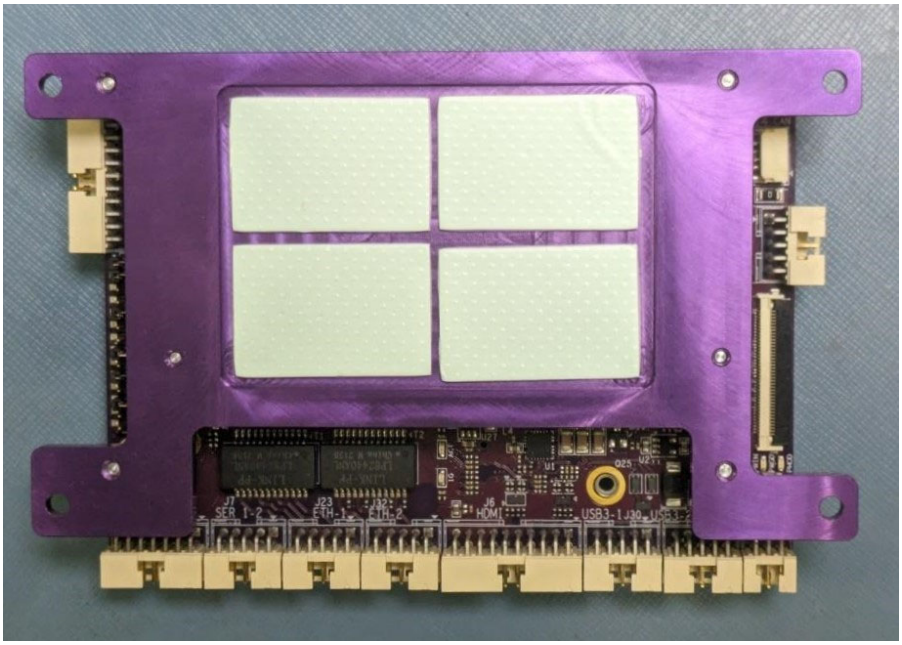


Figure 2-3: Jackson ER full assembly with Orin module and heat spreader

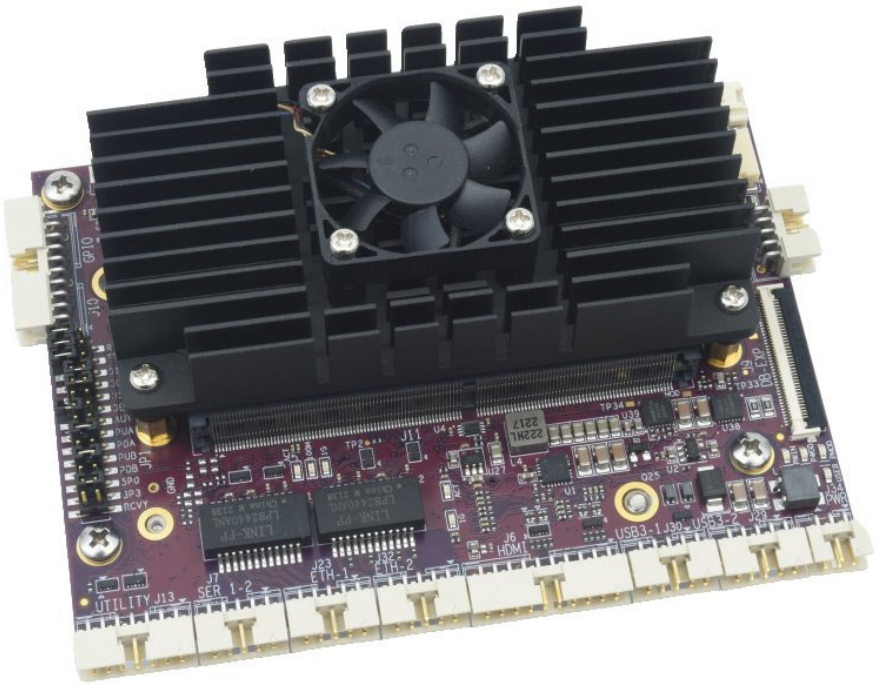


Figure 24: Jackson ER full assembly with Orin module and heat sink and Fan

2.4 Orin NX and Orin Nano Modules Overview

Orin Nano Feature Description

Features	***Jetson Orin Nano 4GB/8GB***
AI Performance	20 TOPS (Sparse) |10 TOPS (Dense) / 40 TOPS (Sparse) |20 TOPS (Dense)
GPU	512 core NVIDIA Ampere GPU with 16 Tensor Cores / 1024 core NVIDIA Ampere GPU with 32 Tensor Cores
CPU	6core NVIDIA Arm® Cortex A78AE v8.2 64-bit CPU, 1.5 GHz 1.5MB L2 + 4MB L3
VIDEO	1x 8K @ 30 Encode (HEVC) 1x 4K @ 60 Decode (HEVC)
MEMORY	4GB 64bit LPDDR5 @2133 MHZ, 34 GB/s / 8GB 128bit LPDDR5 @2133 MHZ, 68 GB/s
CAMERA	8 lanes (2x4 or 4x2) MIPI CSI-2 D-PHY 1.2 (2.5 Gb/s per pair)
CONNECTIVITY	1 Gigabit Ethernet, 3 x1 + 1 x4 PCIe lanes
DISPLAY	HDMI 2.1 and eDP 1.4
USB	3x USB 3.2, 3x USB 2.0
OTHERS	GPIO, I2C, I2S, SPI, UART
POWER	5W to 10W / 7W to 15W

Orin NX Feature Description

Features	***Jetson Orin NX 8GB/16GB***
AI Performance	70 INT8 Sparse TOPs /100 INT8 Sparse TOPS
GPU	1024 core NVIDIA Ampere GPU with 32 Tensor Cores
CPU	6-core NVIDIA A78 CPU /8-core NVIDIA A78 CPU
VIDEO	1x 8K @ 30 Encode (HEVC) 1x 4K @ 60 Decode (HEVC)
MEMORY	8GB 128bit LPDDR5 @2133 MHZ, 102GB/s / 16 GB 128-bit LPDDR5, 3200MHz 102GB/s
CAMERA	8 lanes (2x4 or 4x2) MIPI CSI-2 D-PHY 1.2 (2.5 Gb/s per pair)
CONNECTIVITY	1 Gigabit Ethernet, 3 x1 + 1 x4 PCIe lanes
DISPLAY	HDMI 2.1 and eDP 1.4
USB	3x USB 3.2, 3x USB 2.0
OTHERS	GPIO, I2C, I2S, SPI, UART
POWER	10W to 20W / 10W to 25W

3 FUNCTIONAL OVERVIEW

The following section provides functional details of the key sub-systems implemented on the baseboard.

3.1 Processor Module

The baseboard supports the Orin NX / Nano module. NVIDIA® Jetson Orin™ NX brings AI supercomputer performance to the edge in a compact system-on-module (SOM) which is smaller than a credit card. Jetson Orin NX is built around a low-power version of the NVIDIA Orin SoC, combining the NVIDIA Ampere™ GPU architecture with 64-bit operating capability, integrated advanced multi-function video and image processing, and NVIDIA Deep Learning Accelerators, loaded with 16 GB of memory and 102 GB/s of memory bandwidth. It features a variety of standard hardware interfaces that make it easy to integrate it into a wide range of products and form factors.

3.2 Power Supply

The board can be powered from wide input voltage range of +7V to +20V for full feature.

The maximum allowable ripple, measured at the voltage input connector is 50mV p-p.

All required supply voltages for the board are derived from +(7V-20V) input. These power supplies must be sized to support the highest capacity on-board memory and have enough reserve capacity to support the below add-on features.

Orin Nano module requires fixed 5V input supply. Orin NX module supports 5V to 20V wide input voltage.

Jackson ER board is designed for 7V to 20V wide input voltage and based on the output signal 'MODULE_ID' from module, the required input voltage is supplied to the module through load switches.

MODULE	MODULE_ID	Module I/P Voltage
Orin Nano	0	5V
Orin NX	1	VIN (10-20V)

Current requirement details for major components on the board are described in the below table.

Input (7V)	5V	3.3V	1.5V	Feature
	5A			Orin Nano Module
2.5A				Orin NX Module
	2.7A			USB3.0/2.0
		1.3A	0.15A	mPCIe
		1.5A		M.2
		0.5A		CSI Camera
	0.2A			HDMI
2.5A				Daughter card/Expansion

Note: Input voltage can be lowered to 7V (7-20V input range) as a custom option. Contact DSC for this option.

3.3 Ethernet

The base board provides two 10/100/1000 Ethernet ports, one directly from the module and second 10/100/1000 Ethernet port is derived from the Intel WGI210IT PCIe Ethernet controller. This controller is accessed via x1 PCIe lane from the Orin NX / Nano module which is also muxed with the expansion connector used to plug expansion cards. Either the second ethernet port or expansion cards are supported by the base board.

The ethernet ports are terminated on 2x5 Latching connectors (J23 and J32). Connectors are equipped with LINK and ACT LEDs closer to the magnetics.

3.4 Display

The board offers one HDMI2.1 a/b video output option with audio. The HDMI video output is terminated on a single 2x10 Latching connector.

3.5 Expansion connector

The board offers an optional Expansion connector for customers who want additional Ethernet, USB3.0 and USB2.0 options.

The expansion board will have a PCIe Ethernet controller and an Ethernet switch to support additional Ethernet ports. USB3.0 as well as USB2.0 hub are provided on the expansion board to support additional USB3.0 and USB2.0 ports. The power to the Expansion board will be provided by the carrier board through the FFC connector. The variable input power is routed to the FFC connector; 5V and 3.3V are also routed to the FFC connector.

The PCIex1 lane is muxed with I210 ethernet controller and the expansion connector; one of the two features are supported by the base board.

Also, the USB3.0 and USB2.0 interfaces on the expansion connector are made available at 2x5 pin header through a mux and either of the one is supported by the base board.

3.6 Camera

Jackson ER brings eight MIPI CSI lanes to the board-to-board (B2B) 80-pin connector to plug the camera adapter card. Two quad-lane camera streams or four dual lane camera streams are supported. Each data lane has a peak bandwidth of up to 2.5Gbps.

Camera adaptor board supporting 2x 4 CSI lanes over 22 pin connectors can be plugged to 80-pin B2B connector. Supporting signals like I2C and control signals for the CSI are available at 80-pin connector.

Any custom requirements for cameras can be met using customized camera adapter board. Contact Diamond Systems for such specific requirements.

Base board provides 2nos M2.5 5mm M/F spacers along with screws to install camera adaptor board at the bottom side of Jackson ER base board.

3.7 Serial Ports

Baseboard supports two serial ports. Port 1 supports only RS232 interface, and it is common for all variants. Port 2 supports RS232/RS485/422 UART 3.3V TTL based on the jumper settings and the board variant.

Port 1 and 2 is terminated on 2x5 latching connector (J7). Port selection is controlled via jumper settings on JP1 which includes mode selection and termination.

3.8 PCIe Link Routing

The base board utilizes the PCIe lanes from module as per below table:

Lane	Port	Lane width	Peripheral
UPHY0, Lane 4	C4	x4	M.2 PCIe SSD
UPHY0, Lane 5			
UPHY0, Lane 6			
UPHY0, Lane 7			
UPHY0, Lane 3	C1	x1	I210/ Expansion
UPHY2, Lane 0	C7	x1	M.2 E Key
UPHY2, Lane 1	C9	x1	Minicard

3.9 M.2 Socket

The board is equipped with an M.2 M-Key socket to plug-in 2280/2242 x4 PCIe NVMe cards. As there is no onboard memory on the Orin NX/Nano module, a PCIe SSD must be utilized always.

Base board provides onboard M3 4mm spacer along with a screw to mount M.2 2280 module. M3 4mm spacer along with 2nos of screws are provided to mount M.2 2242 SSD.

The board supports M.2 E key with x1 PCIe and x1 USB2.0 interfaces which provides additional options for expansion.

Base board provides onboard M3 2mm spacer along with a screw to mount M.2E key module.

3.10 Minicard

The board offers one full (51mm length) size Minicard socket. Minicard interface supports PCIex1 lane and USB2.0 x1 interfaces. Nano sim connector is also supported to extend the functionality.

Baseboard provides 2nos onboard M2 4mm spacer and screws on the minicard sockets to mount the modules.

3.11 USB

The board provides access to 3x USB3.2/ USB2.0 ports from the module and 1x USB2.0 port from USB2.0 hub.

1x USB3.2 and 1x USB2.0 ports from the module are muxed between the expansion connector and the header; It will be available only in the expansion connector on plugging the expansion card.

2x USB3.2 and 1x USB2.0 ports from the module, along with x1 USB2.0 port from the USB2.0 hub is provided on 2x5 latching connector where x1 USB2.0 port from the module can be used for programming in the recovery mode. No separate connector is provided for recovery mode.

The USB3.2 / USB2.0 port mapping is done as per the below table:

<table>
<tr><th colspan="3">USB3.2 Ports</th></tr>
<tr><td>Port from Module</td><td colspan="2">Port Termination</td></tr>
<tr><td>Port 0</td><td colspan="2">Latching Connector (J29)</td></tr>
<tr><td>Port 1</td><td colspan="2">Expansion Connector / Header (J12/J9)</td></tr>
<tr><td>Port 2</td><td colspan="2">Latching Connector (J30)</td></tr>
<tr><th colspan="3">USB2.0 Ports</th></tr>
<tr><td>Port from Module</td><td colspan="2">Port Termination</td></tr>
<tr><td>Port 0 (Recovery)</td><td colspan="2">Latching Connector (J29)</td></tr>
<tr><td>Port 1</td><td colspan="2">Expansion Connector / Header (J12/J9)</td></tr>
<tr><td rowspan="4">Port 2</td><td rowspan="4">USB 2.0 HUB
(1:4)</td><td>M.2 E Key (J17)</td></tr>
<tr><td>Minicard Socket (J18)</td></tr>
<tr><td>Latching Connector (J30)</td></tr>
<tr><td>1x5 Header (J21)</td></tr>
</table>

3.12 Digital I/O

The board provides 16x digital I/O lines, which are individually configurable as an output or input. Digital I/O lines are realized using an I2C GPIO expander. The I2C control for the expander is directly fed from the module. This I2C is 3.3V compliant, hence no level translation is necessary. This expander device is accessible on the I2C address 0x22.The I/O lines are made available on a 2x10 latching connector and 2x7 latching connector.

3.13 Controller Area Network (CAN)

The base board is equipped with a CAN interface. The interface can be realized with a non-isolated TJA1042T,118 transceiver or with an isolated ADM3053BRWZ transceiver, available as assembly options. By default, the CAN is realized with the non-isolated TJA1042T,118 transceiver.

3.14 Utility

Some of the housekeeping & additional interfaces signals like Power button, Debug TTL UART, Reset and Force recovery signals are available through a 2x7s utility header.

3.15 LED Indicators

The board provides the following LED indicators. All LEDs are located near to the board edge or their respective features. All LEDs are labeled in silkscreen with their function.

PWIN	Green LED for Power IN
PWGD	Green LED for Power Good indication.
PMOD	Green LED for Boot indication.
USER	Green LED for user /boot indication

4 FUNCTIONAL BLOCK DIAGRAM

4.1 Jackson ER Carrier Block Diagram

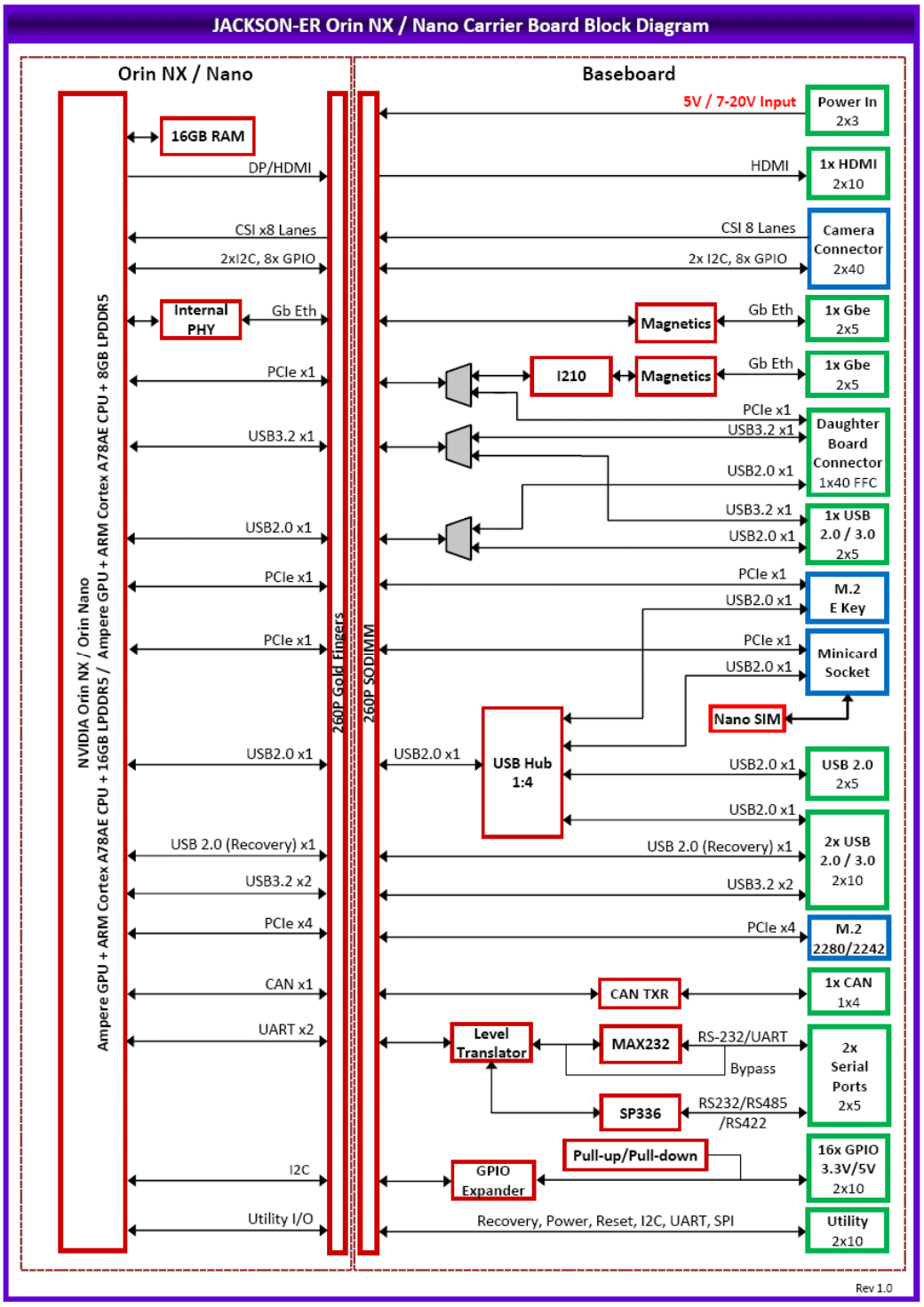


Figure 4-1: Block Diagram of Jackson ER Orin NX / Nano BB01 & BB02 Carrier Board

4.2 Orin NX or Nano Series Module Block Diagram

The following Block Diagram illustrates a high-level view of the Orin NX or Orin Nano Series components. The ports are broken out through the carrier board.

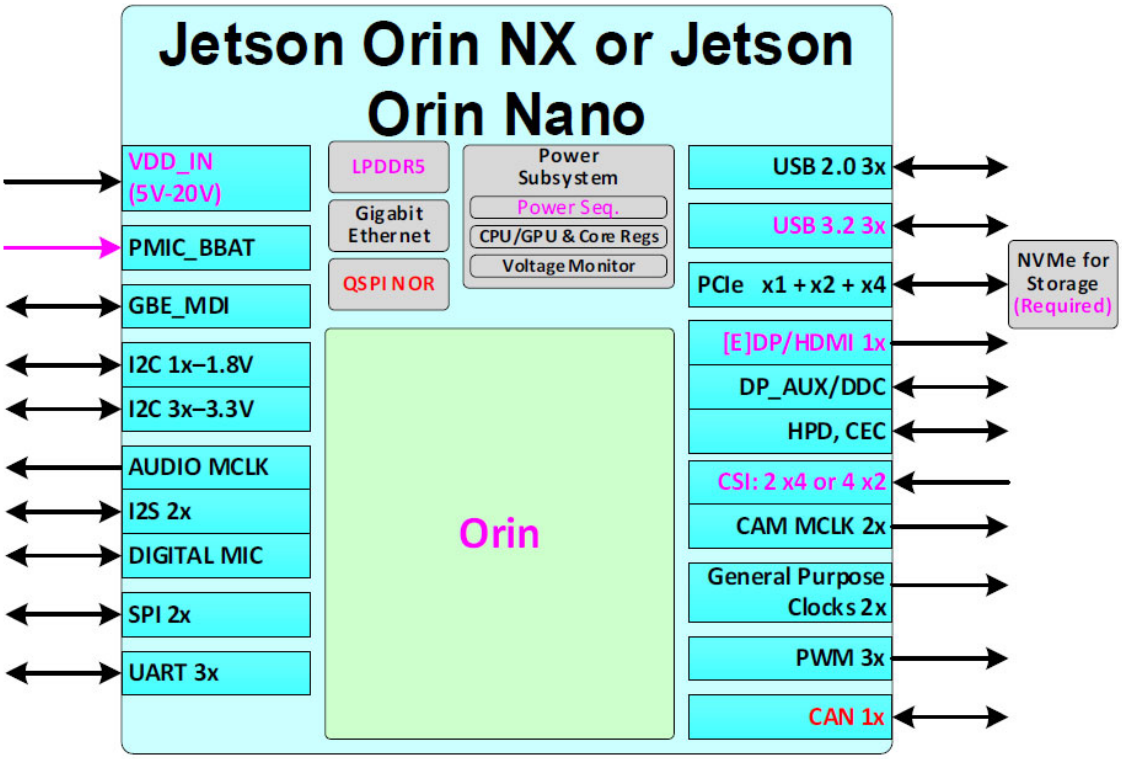


Figure 4-2: Jetson Orin NX/Nano Block diagram

5 MECHANICAL DRAWING

Below figures show the top and bottom views of the Jackson-ER board.

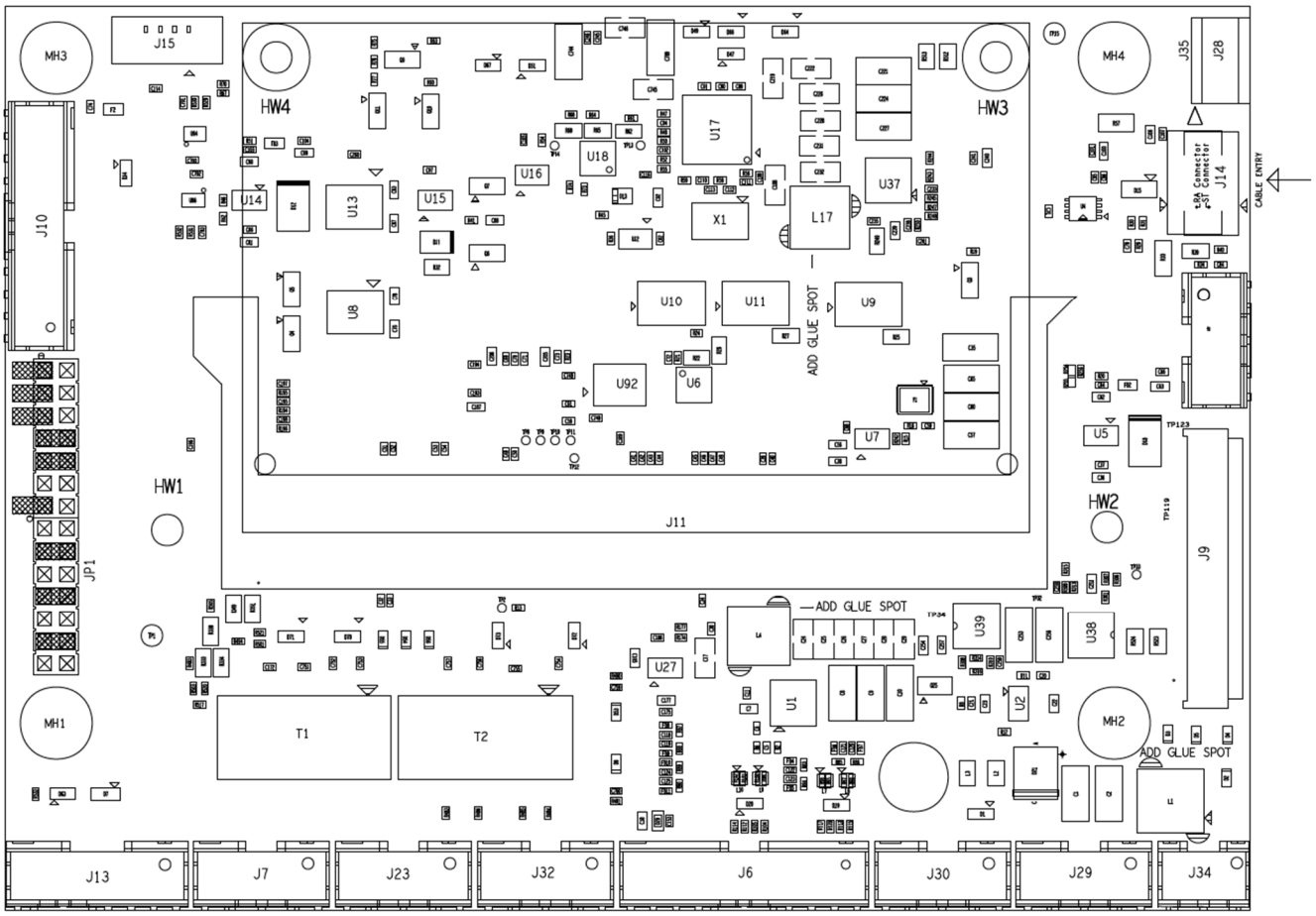


Figure 5-1: Top View

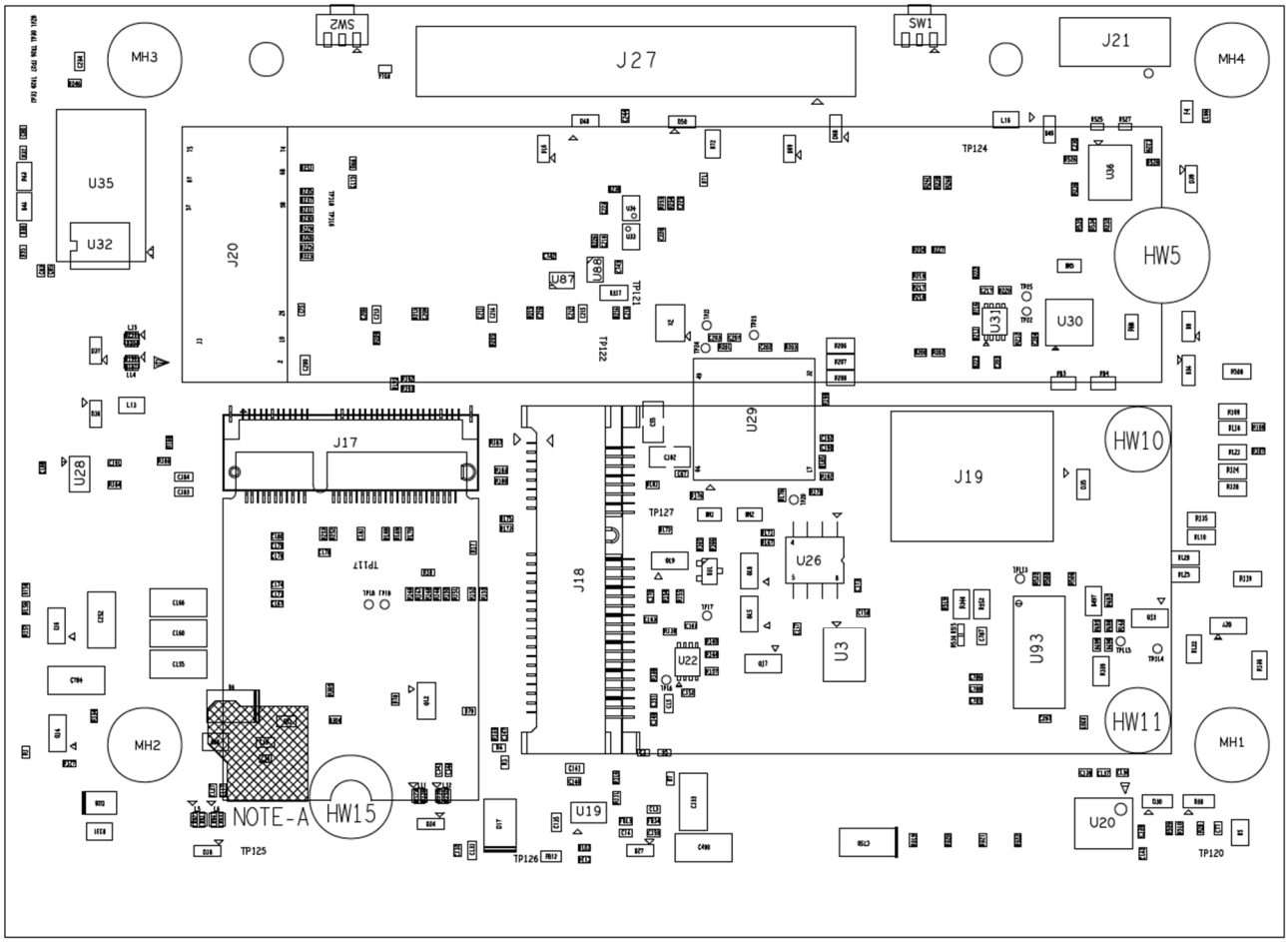


Figure 5-2: Bottom View

6 CONNECTOR AND JUMPER LOCATION

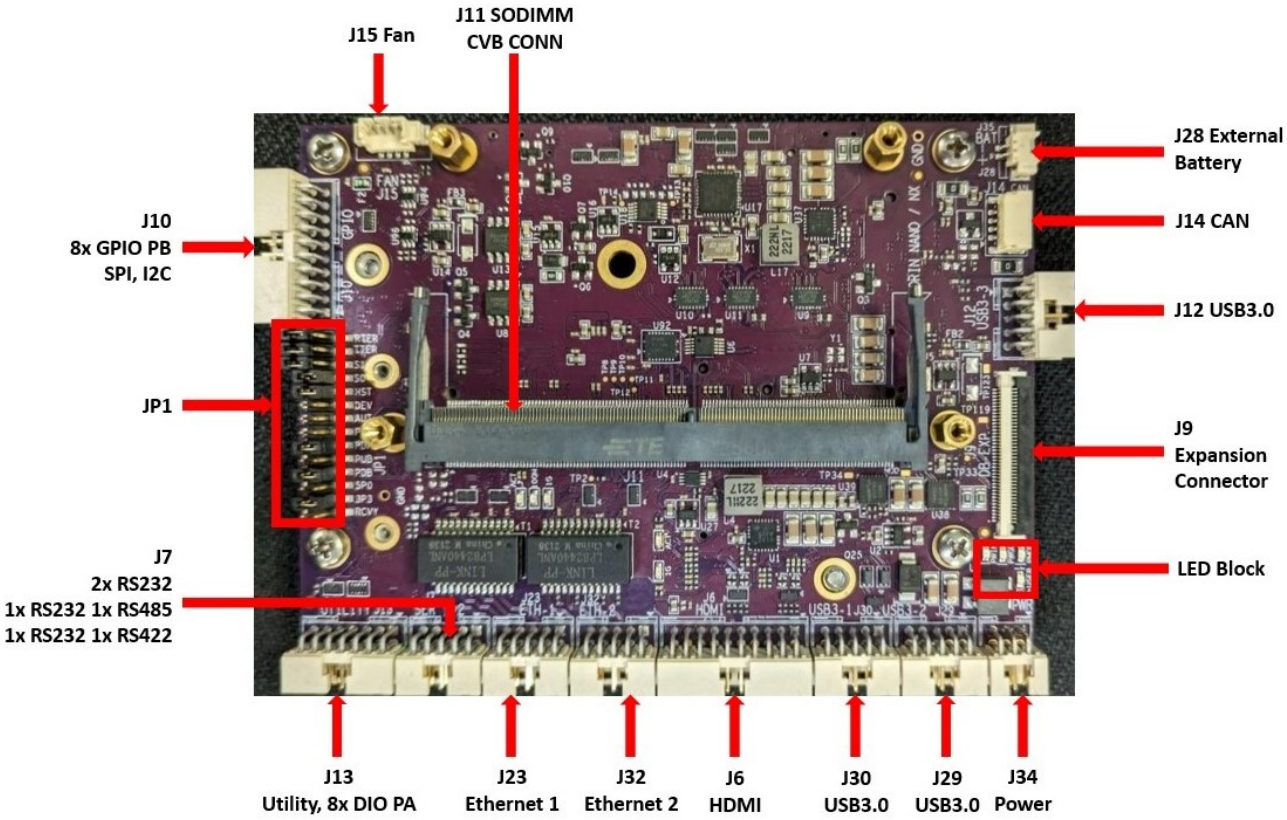


Figure 6-1: Top view of Jackson ER board

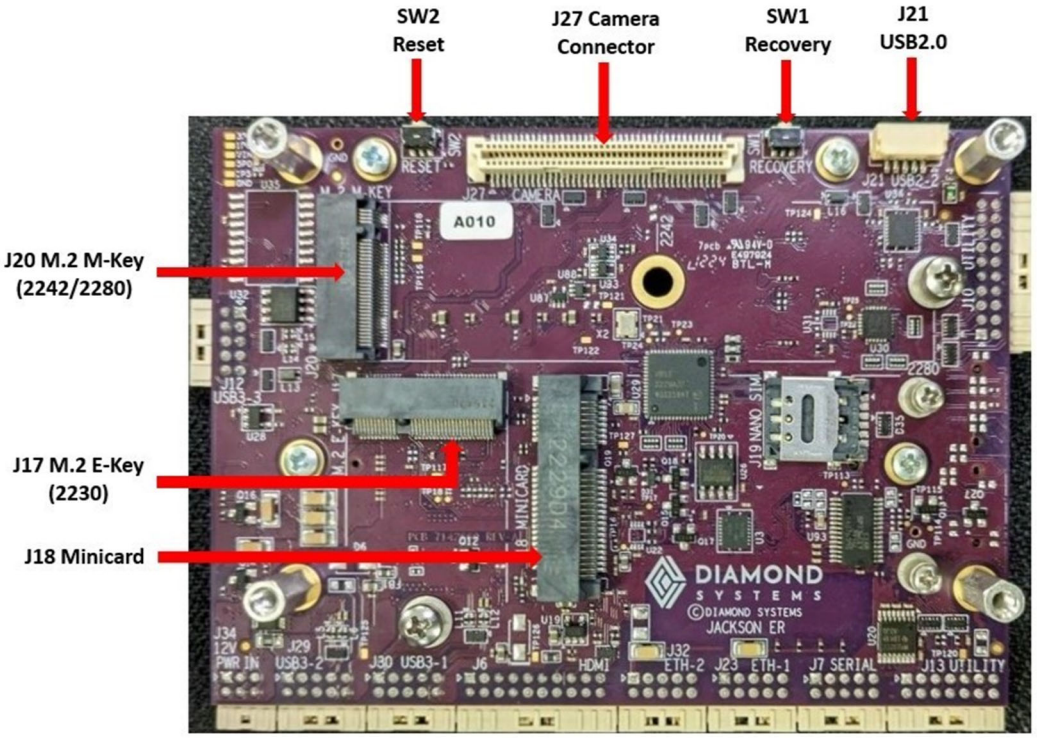


Figure 6-2: Bottom view of Jackson ER board

6.1 Jumper Selection

The Jumper blocks on the Jackson ER board can be configured to enable/disable or alter the default signal routing settings on the circuit, using Jumper shunts.

The following table describes the Jumper Blocks on the baseboard.

Jumper	Description
JP1	DIO voltage selection/DIO push pull selection, Device/ Host mode selection, Serial mode selection and Termination Enable/Disable

Table 1: Jumper details

6.1.1 JP1 Jumper Configuration

JP1 Jumpers are provided to select the voltage level and Pullup/pull down configuration of the DIO. By default, the DIOs are 3.3 Voltage pulled down. USB1 port of the base board is used as a device in the recovery mode to flash the module and is used as a Host in normal operation. This selection is achieved by changing the jumper positions on JP1 as tabulated below:

Position	Function	IN	OUT
RTER	RS422 Receiver Termination	Enabled	***Disabled**
TTER	RS422 Transmitter Termination	Enabled	***Disabled**
S1	Serial Port Protocol Select1	Refer Table	
S0	Serial Port Protocol Select0		
HST	USB2 J29 Port Host Mode	***Enabled**	Disabled
DEV	USB2 J29 Port Device Mode	Enabled	Disabled
AUT	Auto Power ON	Disabled	***Enabled**
PUA	DIO PORT A Pull up Enable	Enabled	Disabled
PDA	DIO PORT A Pull Down Enable	***Enabled**	Disabled
PUB	DIO PORT B Pull up Enable	Enabled	Disabled
PDB	DIO PORT B Pull Down Enable	***Enabled**	Disabled
5P0	DIO Voltage Level	5V	
3P3	DIO Voltage Level	***3.3V**	
RCVY	Recovery Mode	Enabled	Disabled
***Default Mode**			

Serial port Protocol selection Jumper (Detailed):

S1	*S0*	*Protocol*
OUT	OUT	RS422
OUT	IN	RS232
IN	OUT	RS485
IN	IN	Not Valid

7 CONNECTOR SPECIFICATIONS

7.1 Jetson Module I/O Connector (J11)

Jetson Orin Module Function	Pin#	Pin#	Jetson Orin Module Function
GND	1	2	GND
CSI1_D0_N	3	4	CSI0_D0_N
CSI1_D0_P	5	6	CSI0_D0_P
GND	7	8	GND
CSI1_CLK_N	9	10	CSI0_CLK_N
CSI1_CLK_P	11	12	CSI0_CLK_P
GND	13	14	GND
CSI1_D1_N	15	16	CSI0_D1_N
CSI1_D1_P	17	18	CSI0_D1_P
GND	19	20	GND
CSI3_D0_N	21	22	CSI2_D0_N
CSI3_D0_P	23	24	CSI2_D0_P
GND	25	26	GND
CSI3_CLK_N	27	28	CSI2_CLK_N
CSI3_CLK_P	29	30	CSI2_CLK_P
GND	31	32	GND
CSI3_D1_N	33	34	CSI2_D1_N
CSI3_D1_P	35	36	CSI2_D1_P
GND	37	38	GND
USBSS1_RX_N	39	40	PCIE2_RX0_N
USBSS1_RX_P	41	42	PCIE2_RX0_P
GND	43	44	GND
USBSS1_TX_N	45	46	PCIE2_TX0_N
USBSS1_TX_P	47	48	PCIE2_TX0_P
GND	49	50	GND
USBSS2_RX_N	51	52	PCIE2_CLK_N
USBSS2_RX_P	53	54	PCIE2_CLK_P
GND	55	56	GND
USBSS2_TX_N	57	58	PCIE2_RX1_N (PCIE3_RX0_N)
USBSS2_TX_P	59	60	PCIE2_RX1_P (PCIE3_TX0_P)
GND	61	62	GND
DP1_TXD0_N	63	64	PCIE2_TX1_N (PCIE3_TX0_N)
DP1_TXD0_P	65	66	PCIE2_TX1_P (PCIE3_TX0_P)
GND	67	68	GND
DP1_TXD1_N	69	70	RSVD
DP1_TXD1_P	71	72	RSVD
GND	73	74	GND
DP1_TXD2_N	75	76	RSVD
DP1_TXD2_P	77	78	RSVD
GND	79	80	GND
DP1_TXD3_N	81	82	RSVD
DP1_TXD3_P	83	84	RSVD
GND	85	86	GND
GPIO00	87	88	RSVD
SPI0_MOSI	89	90	RSVD
SPI0_SCK	91	92	RSVD
SPI0_MISO	93	94	HDMI_CEC
SPI0_CS0*	95	96	DP1_HPD
SPI0_CS1*	97	98	DP1_AUX_N

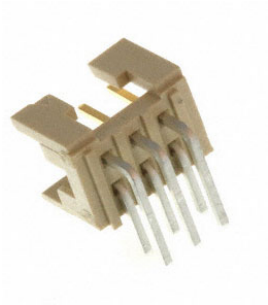
UART0_TXD	99	100	DP1_AUX_P
UART0_RXD	101	102	GND
UART0_RTS*	103	104	SPI1_MOSI
UART0_CTS*	105	106	SPI1_SCK
GND	107	108	SPI1_MISO
USB0_D_N	109	110	SPI1_CS0*
USB0_D_P	111	112	SPI1_CS1*
GND	113	114	CAM0_PWDN
USB1_D_N	115	116	CAM0_MCLK
USB1_D_P	117	118	GPIO01
GND	119	120	CAM1_PWDN
USB2_D_N	121	122	CAM1_MCLK
USB2_D_P	123	124	GPIO02
GND	125	126	GPIO03
GPIO04	127	128	GPIO05
GND	129	130	GPIO06
PCIE0_RX0_N	131	132	GND
PCIE0_RX0_P	133	134	PCIE0_TX0_N
GND	135	136	PCIE0_TX0_P
PCIE0_RX1_N	137	138	GND
PCIE0_RX1_P	139	140	PCIE0_TX1_N
GND	141	142	PCIE0_TX1_P
CAN_RX	143	144	GND
CAN_TX	145	146	GND
GND	147	148	PCIE0_TX2_N
PCIE0_RX2_N	149	150	PCIE0_TX2_P
PCIE0_RX2_P	151	152	GND
GND	153	154	PCIE0_TX3_N
PCIE0_RX3_N	155	156	PCIE0_TX3_P
PCIE0_RX3_P	157	158	GND
GND	159	160	PCIE0_CLK_N
USBSS0_RX_N	161	162	PCIE0_CLK_P
USBSS0_RX_P	163	164	GND
GND	165	166	USBSS0_TX_N
PCIE1_RX0_N	167	168	USBSS0_TX_P
PCIE1_RX0_P	169	170	GND
GND	171	172	PCIE1_TX0_N
PCIE1_CLK_N	173	174	PCIE1_TX0_P
PCIE1_CLK_P	175	176	GND
GND	177	178	MOD_SLEEP*
PCIE_WAKE*	179	180	PCIE0_CLKREQ*
PCIE0_RST*	181	182	PCIE1_CLKREQ*
PCIE1_RST*	183	184	GBE_MDI0_N
I2C0_SCL	185	186	GBE_MDI0_P
I2C0_SDA	187	188	GBE_LED_LINK
I2C1_SCL	189	190	GBE_MDI1_N
I2C1_SDA	191	192	GBE_MDI1_P
I2S0_DOUT	193	194	GBE_LED_ACT
I2S0_DIN	195	196	GBE_MDI2_N
I2S0_FS	197	198	GBE_MDI2_P
I2S0_SCLK	199	200	GND
GND	201	202	GBE_MDI3_N
UART1_TXD	203	204	GBE_MDI3_P
UART1_RXD	205	206	GPIO07
UART1_RTS*	207	208	GPIO08
UART1_CTS*	209	210	CLK_32K_OUT
GPIO09	211	212	GPIO10
CAM_I2C_SCL	213	214	FORCE_RECOVERY*
CAM_I2C_SDA	215	216	GPIO11
MODULE_ID	217	218	GPIO12

PCIE2_RST*	**219**	**220**	I2S1_DOUT
PCIE2_CLKREQ*	**221**	**222**	I2S1_DIN
PCIE3_RST*	**223**	**224**	I2S1_FS
PCIE3_CLKREQ*	**225**	**226**	I2S1_SCLK
PCIE3_CLK_N	**227**	**228**	GPIO13
PCIE3_CLK_P	**229**	**230**	GPIO14
GND	**231**	**232**	I2C2_SCL
SHUTDOWN_REQ*	**233**	**234**	I2C2_SDA
PMIC_BBAT	**235**	**236**	UART2_TXD
POWER_EN	**237**	**238**	UART2_RXD
SYS_RESET*	**239**	**240**	SLEEP/WAKE*
GND	**241**	**242**	GND
GND	**243**	**244**	GND
GND	**245**	**246**	GND
GND	**247**	**248**	GND
GND	**249**	**250**	GND
VDD	**251**	**252**	VDD
VDD	**253**	**254**	VDD
VDD	**255**	**256**	VDD
VDD	**257**	**258**	VDD
VDD	259	260	VDD

Connector manufacturer / PN: TE / 2309413-1
Connector Type: SODIMM 260P 9.2H STD

7.2 Power In (J34)

The pinouts for power input are as shown below. VIN = +7V to +20V



GND	1	2	VIN
GND	3	4	VIN
GND	5	6	VIN

Connector type: 2x3 2mm latching connector
Connector manufacturer / PN: Amphenol ICC(FCI) / 98464-G61-06ULF
Connector Type: Connector Header Through Hole, Right Angle 6 position 0.079" (2.00mm)

RTC Battery (J35)

The pinouts for RTC battery power input are as shown below:

1	RTC_BATT
2	GND

RTC BATT = +1.85 - +5.5V
Connector Part Number: 0533980271
Manufacturer: Molex
Mating Cable PN: 6980529 (cable with paddle terminals for soldering to battery)
4713001 (backup battery with soldered wire leads)

7.3 Fan (J15)

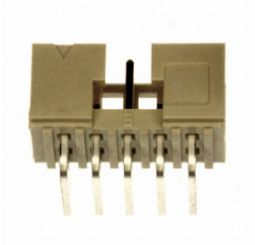
The pinouts for the fan connector are as shown below:

1	PWM
2	TACH
3	5V
4	GND

Connector Part Number: 0533980471
Manufacturer: Molex
Supported fan: ASB0305HP-00CP4 (included in Diamond Systems fan sink part no. 6882651)

7.4 Ethernet (J23, J32)

The Ethernet ports are terminated on two 2x5 latching connectors.

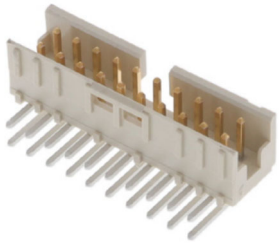


GND_ETH	1	2	NC
GBE_TR0_P	3	4	GBE_TR0_N
GBE_TR1_P	5	6	GBE_TR1_N
GBE_TR2_P	7	8	GBE_TR2_N
GBE_TR3_P	9	10	GBE_TR3_N

Connector type: 2x5 2mm latching connector
Connector PN: 98464-G61-10ULF
Manufacturer: Amphenol ICC (FCI)
Mating Cable PN: 6980604 Diamonds Systems Cable Assembly

7.5 HDMI (J6)

HDMI port is available from module and will be available on an HDMI vertical stacked standard connector as shown below. The connector follows the industry-standard pinout.

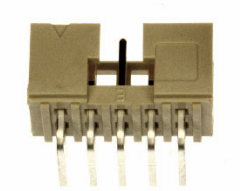


HDMI_D2_P	1	2	GND
HDMI_D2_N	3	4	HDMI_D1_P
GND	5	6	HDMI_D1_N
HDMI_D0_P	7	8	GND
HDMI_D0_N	9	10	HDMI_CLK_CON_P
GND	11	12	HDMI_CLK_CON_N
HDMI_CEC_CON	13	14	RSVD
HDMI1_DDC_CLK	15	16	HDMI1_DDC_DATA
GND	17	18	V_5P0_HDMI
HDMI_HPD_CON	19	20	GND_CH

Connector type: 2x10 2mm latching connector
Connector PN: 98464-G61-20ULF
Manufacturer: Amphenol ICC (FCI)
Mating cable PN: 6980605 Diamonds Systems Cable Assembly

7.6 Serial Ports (J7)

Two serial ports are provided on this connector, one supporting fixed RS-232 and the second supporting RS232/RS485 (selected based on Jumper settings). The RS232/RS485 or UART is also available in RJ12 connector on the front edge but at a time only one of the connectors must be used.



TX1	1	2	RTS1
RX1	3	4	CTS1
GND	5	6	GND
TX1/TX1_P/RX1_P	7	8	RTS1/TX1_N/RX1_N
RX1/RX1_P	9	10	CTS1/RX1_N

Connector type: 2x5 2mm latching connector
Connector PN: 98464-G61-10ULF
Manufacturer: Amphenol ICC (FCI)
Mating Cable PN: 6980601 Diamonds Systems Cable Assembly

7.7 CSI Camera (J27)

An 80-pin board-to-board connector is used to connect a series of camera adapter boards to Jackson ER. This enables Jackson ER to work with any CSI or GMSL camera by designing a suitable adapter with the required connectors, pinouts, and circuitry where required. The adapter board mounts on two standoffs on the bottom side of the board. Larger adapters can use taller mating connectors to straddle the board and mount on all 4 of the heat sink mounting holes.

Contact Diamond Systems for a list of available camera adapters and associated cameras. Custom adapter development can be provided by Diamond Systems, and the design requirements can be provided for customers to design their own adapters.

V_3P3	1	41	NC
GND_DIG	2	42	NC
CAM2_I2C_SDA_3P3	3	43	NC
CSI2_D3_P	4	44	NC
CAM2_I2C_SCL_3P3	5	45	NC
CSI2_D3_N	6	46	V_5P0
GND_DIG	7	47	I2C0_GP_CLK_3P3
GND_DIG	8	48	V_5P0
CAM2_MCLK_3P3	9	49	I2C0_GP_DAT_3P3
CSI2_CLK_P	10	50	V_5P0
CAM2_PWDN_3P3	11	51	CAM1_I2C_SDA_3P3
CSI2_CLK_N	12	52	V_5P0
GND_DIG	13	53	CAM1_I2C_SCL_3P3
GND_DIG	14	54	V_VIN
CSI2_D2_P	15	55	GND_DIG
CSI2_D0_P	16	56	V_VIN
CSI2_D2_N	17	57	CSI1_CLK_P
CSI2_D0_N	18	58	V_VIN
GND_DIG	19	59	CSI1_CLK_N
GND_DIG	20	60	GND_DIG
CSI2_D1_P	21	61	GND_DIG
CSI3_CLK_P	22	62	GND_DIG
CSI2_D1_N	23	63	CSI0_D3_P
CSI3_CLK_N	24	64	CAM0_MCLK_3P3
GND_DIG	25	65	CSI0_D3_N
GND_DIG	26	66	CAM0_PWDN_3P3
CAM_I2C_SCL_3P3	27	67	GND_DIG
CAM_GPIO1_1P8	28	68	GND_DIG
CAM_I2C_SDA_3P3	29	69	CSI0_CLK_P
CAM_GPIO2_1P8	30	70	CSI0_D2_P
CAM_MUX_SEL0	31	71	CSI0_CLK_N
CAM_GPIO3_1P8	32	72	CSI0_D2_N
V_3P3	33	73	GND_DIG
CAM_GPIO4_1P8	34	74	GND_DIG
V_3P3	35	75	CSI0_D0_P
NC	36	76	CSI0_D1_P
V_3P3	37	77	CSI0_D0_N
NC	38	78	CSI0_D1_N
NC	39	79	GND_DIG
NC	40	80	GND_DIG

Connector PN: G832MB030801322HR

Note: Standard board-to-board mating height for CSI adapters is 6mm.

7.8 CAN (J14)

The pinouts for the CAN connector are as shown below:

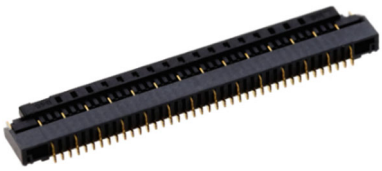
1	GND CAN
2	CAN_L
3	CAN_H
4	GND CAN

Connector PN: BM04B-GHS-TBT(LF)(SN)(N)
Connector Type: 1x4 1.25mm pitch SMD
Manufacturer: JST Sales America Inc.
Mating Cable PN: 6981182

7.9 Expansion connector (J9)

1x PCIe x1 lane, 1x USB3.0 and 1x USB2.0 ports are routed to a high-speed 40-contact single-sided FFC (flat flex cable) Expansion connector to support additional Ethernet, USB3.0 and USB2.0 ports. To use the additional interface, a daughter board expansion is required. For more details about daughter board, contact DSC. Pinout of the expansion connector is as follows (pinout is shown in 2 columns for compactness).

1	VIN	**21**	USB2_D1_DB_P
2	VIN	**22**	GND
3	VIN	**23**	USB3_TX1_DB_P
4	VIN	**24**	USB3_TX1_DB_N
5	VIN	**25**	GND
6	VIN	**26**	USB3_RX1_DB_P
7	VIN	**27**	USB3_RX1_DB_N
8	VIN	**28**	GND
9	PCIE RESET#	**29**	PCIE1_CLKREQ_NX_3P3#
10	GND	**30**	DB_PRESENT_3P3#
11	PCIE1_XNX_DB_TX_P	**31**	GND
12	PCIE1_XNX_DB_TX_N	**32**	NC
13	GND	**33**	NC
14	PCIE1_XNX_DB_RX_P	**34**	NC
15	PCIE1_XNX_DB_RX_N	**35**	NC
16	GND	**36**	NC
17	PCIE1_XNX_DB_CLK_P	**37**	NC
18	PCIE1_XNX_DB_CLK_N	**38**	GND
19	GND	**39**	NC
20	USB2_D1_DB_N	**40**	PCIE_MOD_WAKE_3P3#

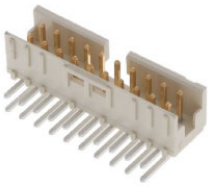


Connector type: 40 position 0.5mm pitch FFC latching connector
Connector PN: 5051104091
Manufacturer: Molex

7.10 Digital I/O (J10)

The board provides 16x GPIOs which can be individually programmed for input or output functionalities. The GPIOs are accessible on a 2x10 header.

JP1 Jumpers are used to select the voltage level (3.3V/5V) and Pullup/pull down configuration of the DIO. By default, the DIOs are 3.3 Voltage, pulled down. Refer section 6.1.1 for more information on jumper settings.



DIO_PB0	1	2	DIO_PB1
DIO_PB2	3	4	DIO_PB3
DIO_PB4	5	6	DIO_PB5
DIO_PB6	7	8	DIO_PB7
GND	9	10	I2C1_GP_CLK_3P3
I2C_GP_DAT_3P3	11	12	GND
SPI_MISO_3P3	13	14	SPI_MOSI_3P3
SPI_CLK_3P3	15	16	SPI_SS_3P3#
GND	17	18	V_3P3P_UTLY
V_5P0_UTLY	19	20	GND

Connector Type: 2x10 2mm RA Through-Hole Pin Header, 2mm mating post length
Connector PN: 98464-G61-20ULF
Manufacturer: Amphenol ICC (FCI)
Cable PN: 6980607 Diamonds Systems Cable Assembly

7.11 M.2 PCIe SSD Socket (J20)

An M.2 M-key connector is provided for storage applications interfaced by the x4 PCIe lanes directly from the Orin NX / Nano module. All TX/RX signals are with respect to the Module.

The connector pinouts are as given below:

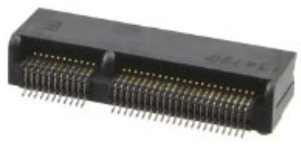
GND	1	2	3.3V
GND	3	4	3.3V
PERn3	5	6	ERASE MEMORY
PERp3	7	8	NC
GND	9	10	NC
PETn3	11	12	3.3V
PETp3	13	14	3.3V
GND	15	16	3.3V
PERn2	17	18	3.3V
PERp2	19	20	NC
GND	21	22	NC
PETn2	23	24	NC
PETp2	25	26	NC
GND	27	28	NC
PERn1	29	30	NC
PERp1	31	32	NC
GND	33	34	NC
PETn1	35	36	NC
PETp1	37	38	NC
GND	39	40	I2C_CLK
PERn0	41	42	I2C_DAT
PERp0	43	44	ALERT
GND	45	46	NC
PETn0	47	48	NC
PETp0	49	50	PERST#
GND	51	52	CLKREQ#
REFCLKN	53	54	PEWake#
REFCLKP	55	56	NC
GND	57	58	NC
	KEY		
NC	67	68	SUSCLK
NC	69	70	3.3V
GND	71	72	3.3V
GND	73	74	3.3V
GND	75		

Connector PN: 10128798-005RLF
Connector Type: M-Key

7.12 M.2 E-Key (J17)

An M.2 E-Key connector is provided with x1 PCIe and x1 USB2.0. All TX/RX signals are with respect to the Module. TX on the socket drives RX on the installed module, and RX on the socket is driven by TX on the installed module. One mounting standoff is used at the far end of the module installation site. This standoff is not connected to ground.

GND	1	2	V_3P3
USB2_AP_P	3	4	V_3P3
USB2_AP_N	5	6	NC
GND	7	8	NC
NC	9	10	NC
NC	11	12	NC
NC	13	14	NC
NC	15	16	NC
NC	17	18	GND
NC	19	20	NC
NC	21	22	NC
NC	23	32	NC
	KEY		
GND	33	34	NC
PCIE1_M2_TX0_P	35	36	NC
PCIE1_M2_TX0_N	37	38	NC
GND	39	40	NC
PCIE1_RX0_P	41	42	NC
PCIE1_RX0_N	43	44	NC
GND	45	46	NC
PCIE1_CLK_P	47	48	NC
PCIE1_CLK_N	49	50	M2E_SUSCLK_32KHZ
GND	51	52	PCIE1_RST
PCIE1_CLKREQ	53	54	W_DISABLE2
PCIE_WAKE	55	56	W_DISABLE1
GND	57	58	I2C2_M2E_SDA
NC	59	60	I2C2_M2E_SCL
NC	61	62	NC
GND	63	64	NC
NC	65	66	NC
NC	67	68	NC
GND	69	70	NC
NC	71	72	V_3P3
NC	73	74	V_3P3
GND	75	76	GND
GND	77		

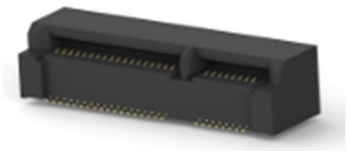


Connector PN: 2199230-4
Connector Type: E-Key

7.13 Minicard (J18)

The minicard provides extension options with x1 PCIe and x1 USB2.0 with SIM connector. All TX/RX signals are with respect to the host. TX on the socket drives RX on the installed module, and RX on the socket is driven by TX on the installed module. The mounting standoffs of the module installation site are not connected to ground.

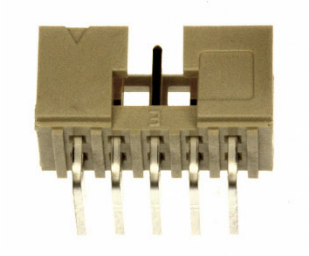
PCIe WAKE#	1	2	V_3P3
NC	3	4	GND
NC	5	6	+1.5V
PCIe CLKREQ#	7	8	UIM PWR
GND	9	10	UIM DATA
PCIe CLK-	11	12	UIM CLK
PCIe 1 Clk+	13	14	UIM RESET
GND	15	16	UIM VPP
	KEY		
NC	17	18	GND
NC	19	20	NC
GND	21	22	PCIe Reset-
PCIe RX-	23	24	V_3P3
PCIe RX+	25	26	GND
GND	27	28	+1.5V
GND	29	30	NC
PCIe TX-	31	32	NC
PCIe TX+	33	34	GND
GND	35	36	USB D-
GND	37	38	USB D+
V_3P3	39	40	GND
V_3P3	41	42	NC
GND	43	44	NC
NC	45	46	NC
NC	47	48	+1.5V
NC	49	50	GND
NC	51	52	V_3P3



Connector manufacturer / PN: TE 1759547-1

7.14 USB 3.0/2.0 (J30, J29,J12)

USB3.0/USB2.0 ports of the board are accessed with a latching connectors J30,J29,J12 has shown below:
Both top and bottom ports follow the standard pinout.

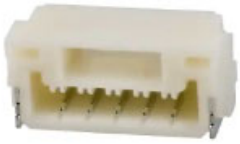


USB3_RX_CH_N	1	2	GND_CH
USB3_RX_CH_P	3	4	GND
GND	5	6	USB2_D_CH_P
USB3_TX_CH_N	7	8	USB2_D_CH_N
USB3_TX_CH_P	9	10	V_USB3

Connector PN: 98464-G61-10ULF
Manufacturer: Amphenol ICC (FCI)
Mating Cable PN: 6980603 Diamonds Systems Cable Assembly

7.15 USB 2.0 (J21)

One USB2.0 port from the USB2.0 hub is available at RA 1x5 pin SMD header (J21) and follows the below pinout:

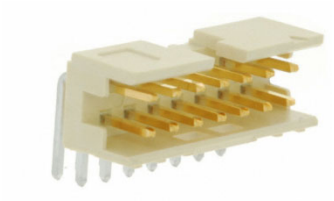


1	USB_PWR
2	USB2_D-
3	USB2_D+
4	GND
5	NC

J21 Connector PN: SM05B-GHS-TB(LF)(SN)
Connector Type: 1x5 1.25mm pitch SMD
Mating Cable PN: 6980504

7.16 Utility (J13)

The base board provides access to a few housekeeping signals on a 2x10 header. The connector pinouts are as follows:

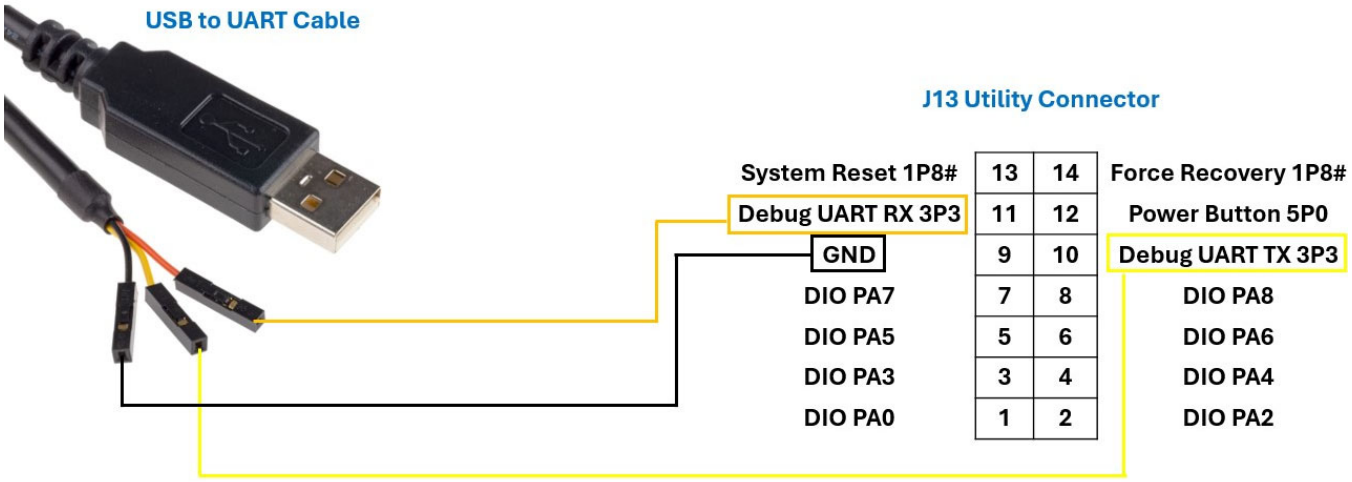


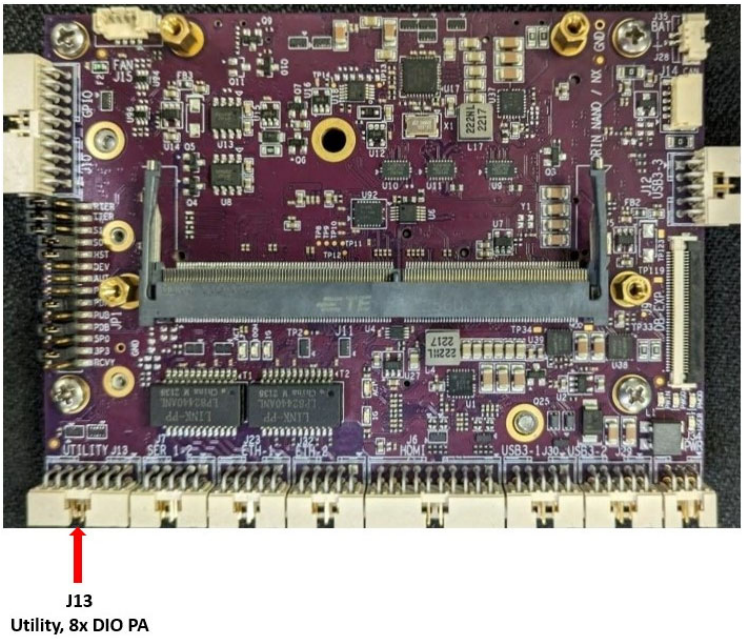
DIO_PA0	1	2	DIO_PA1
DIO_PA2	3	4	DIO_PA3
DIO_PA4	5	6	DIO_PA5
DIO_PA6	7	8	DIO_PA7_MEM_ERS
GND	9	10	UART2_TXD_3P3
UART2_RXD_3P3	11	12	POWER_BTN_5P0#
SYS_RST_1P8#	13	14	FORCE_RECOVERY_1P8#

Connector PN: 98464-G61-14ULF
Connector Type: CONN HEADER R/A 14POS 2MM
Cable PN: 6980614 Diamonds Systems Cable Assembly

8 DEBUG CONSOLE

To connect a debug console to Jackson ER, connect a TTL to USB cable between Jackson ER Utility connector and laptop, then open a serial terminal application like TeraTerm, Putty and log on to Jackson ER. Refer below images for connection details.





9 CONNECTOR SUMMARY

The following table provides a summary of all I/O connectors on the board.

Function	Manufacturer	Part no.	Description	DSC Mating Cable
Module connector	TE Connectivity	98464-G61-06ULF	DIMM Connectors DDR4 SODIMM 260P 9.2H STD	NA
Power In	Amphenol ICC (FCI)	98464-G61-06ULF	CONN HEADER R/A 6POS 2MM	6980613
RTC battery	Molex	0533980271	CONN HEADER VERT 2POS 1.25MM	6980529, 4713001
Fan	Molex	0533980471	CONN HEADER SMD 4POS 1.25MM	NA
GbE	Amphenol ICC (FCI)	98464-G61-10ULF	Connector Header Through Hole, Right Angle 10 position 0.079" (2.00mm)	6980604
HDMI	Amphenol ICC (FCI)	98464-G61-20ULF	CONN HEADER R/A 20POS 2MM	6980605
Serial Ports	Amphenol ICC (FCI)	98464-G61-10ULF	Connector Header Through Hole, Right Angle 10 position 0.079" (2.00mm)	6980601
CAN	JST	BM04B-GHS-TBT(LF)(SN)(N)	CONN HEADER SMD 4POS 1.25MM	6981182
Camera	Amphenol	G832MB030801322HR	CONN B2B 80-PIN 0.8MM PITCH	NA
Expansion Connector	Hirose	FH55-40S-0.5SH	CONN FFC FPC 0.5MM SMD	FFC cable
Digital IO	Amphenol ICC (FCI)	98464-G61-20ULF	CONN HEADER R/A 20POS 2MM	6980607
M.2 SSD socket	Amphenol	10128798-005RLF	CONN FEMALE 67POS 0.020 GOLD	NA
M.2 PCIe E-Key	Amphenol	2199230-4	CONN M.2 FEMALE 67POS 0.020 GOLD	NA
Minicard	TE	1759547-1	CONN PCI EXP MINI FEMALE 52POS	NA
USB 3.0/ USB2.0	Amphenol ICC (FCI)	98464-G61-10ULF	Connector Header Through Hole, Right Angle 10 position 0.079" (2.00mm)	6980603
USB 3.0/ USB2.0	Amphenol ICC (FCI)	98464-G61-10ULF	Connector Header Through Hole, Right Angle 10 position 0.079" (2.00mm)	6980603
USB2.0	JST	SM05B-GHS-TB(LF)(SN)	CONN HEADER SMD 5POS 1.25MM	6980504
Utility	Amphenol ICC (FCI)	98464-G61-14ULF	Connector Header Through Hole, Right Angle 14 position 0.079" (2.00mm)	6980614

10 BRING UP OF NVIDIA JETSON ORIN NX / NANO MODULE

10.1 Required accessories

Any board which has M.2 M-Key NVMe slot and able to boot without M.2 M-Key NVMe.
Host PC installed with Ubuntu 20.4 x86_64, Kernel version: 5.15.0-52 or above.
USB A to USB A cable.
M.2 Key M 2280 NVMe PCIe SSD.
Jackson ER board assembled with Orin NX/Nano module.
Jackson ER BSP released folder.

Programming Orin NX/Nano module involves the following four major steps:

10.2 Formatting the M.2 MKey NVMe module

Connect the NVMe drive to any board which has M.2 M-Key NVMe slot and able to boot without M.2 M-Key NVMe.

Power on the board and open the terminal.

Check the NVMe drive's device name using below command.

$ lsblk -d -p | grep nvme

```
nvidia@nvidia-desktop:~$ lsblk -d -p | grep nvme
/dev/nvme0n1   259:0    0 931.5G  0 disk
nvidia@nvidia-desktop:~$
```

Note the device name (eg. nvme0n1) as it will be used in the next command.

Create a new partition table by using below command:

$ sudo parted /dev/*<nvmeXn1> ***mklabel gpt***

Example with nvme0n1: ***sudo parted /dev/nvme0n1 mklabel gpt***

```
nvidia@nvidia-desktop:~$ sudo parted /dev/nvme0n1 mklabel gpt
[sudo] password for nvidia:
Information: You may need to update /etc/fstab.

nvidia@nvidia-desktop:~$
```

Add the new partition 'APP' by using below command:

$ sudo parted /dev/nvme0n1 mkpart APP 0GB 45GB

```
nvidia@nvidia-desktop:~$ sudo parted /dev/nvme0n1 mkpart APP 0GB 45GB
Information: You may need to update /etc/fstab.

nvidia@nvidia-desktop:~$
```

Format the partition APP as an ext4 partition and mount it by using the command below.

$ sudo mkfs.ext4 /dev/nvme0n1p1

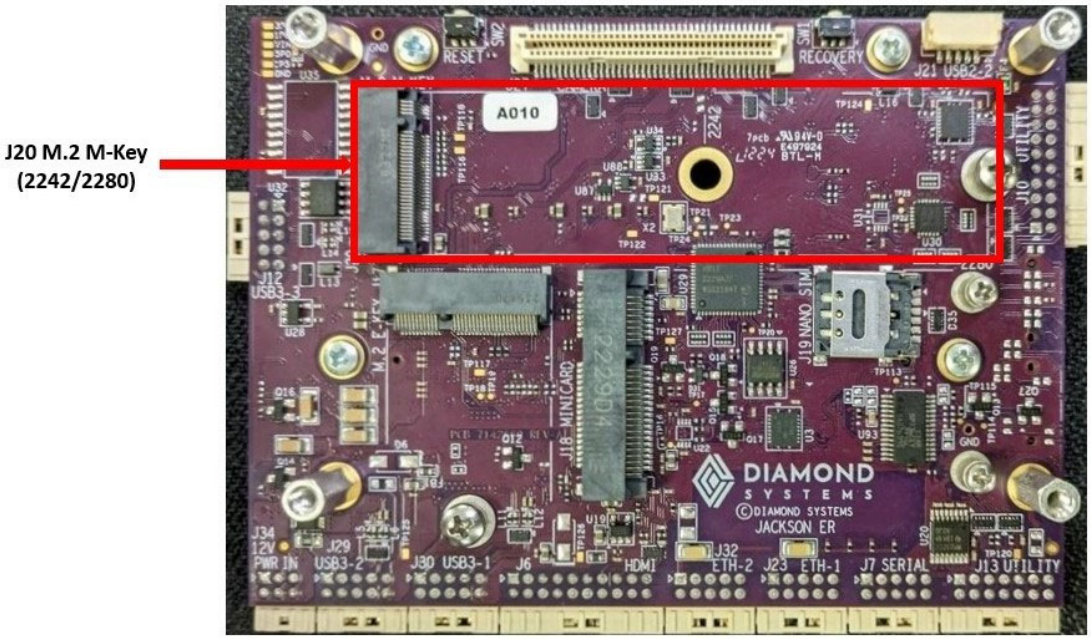
```
nvidia@nvidia-desktop:~$ sudo mkfs.ext4 /dev/nvme0n1p1
mke2fs 1.44.1 (24-Mar-2018)
Discarding device blocks: done
Creating filesystem with 10985984 4k blocks and 2747136 inodes
Filesystem UUID: 1c2ea414-e06b-45bd-9b9d-fc476da6bd5f
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624

Allocating group tables: done
Writing inode tables: done
Creating journal (65536 blocks): done
Writing superblocks and filesystem accounting information: done

nvidia@nvidia-desktop:~$
```

Run the 'lsblk' command. If nvme01p1 is detected as in below image, then the partition is successful.

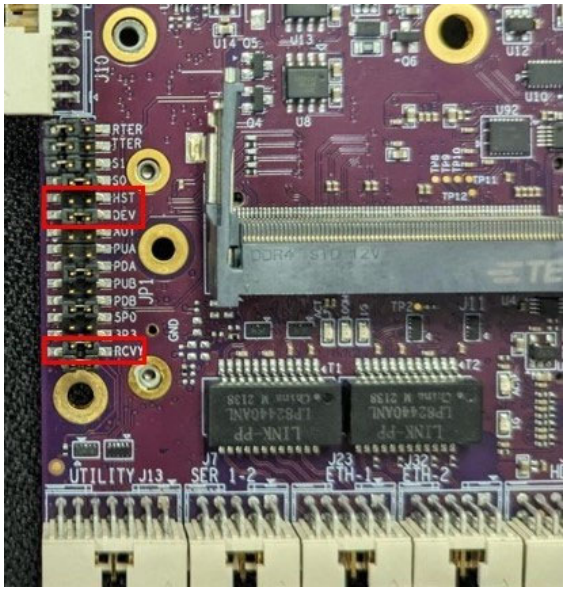
```
nvidia@nvidia-desktop:~$ lsblk
NAME         MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT
loop0          7:0    0    16M  1 loop
sda            8:0    1  14.6G  0 disk /media/nvidia/76BC-6263
mtdblock0     31:0    0    32M  0 disk
mmcblk0      179:0    0  29.8G  0 disk
├─mmcblk0p1  179:1    0  29.4G  0 part /
├─mmcblk0p2  179:2    0    64M  0 part
├─mmcblk0p3  179:3    0    64M  0 part
├─mmcblk0p4  179:4    0   448K  0 part
├─mmcblk0p5  179:5    0   448K  0 part
├─mmcblk0p6  179:6    0    63M  0 part
├─mmcblk0p7  179:7    0   512K  0 part
├─mmcblk0p8  179:8    0   256K  0 part
├─mmcblk0p9  179:9    0   256K  0 part
├─mmcblk0p10 179:10   0   100M  0 part
└─mmcblk0p11 179:11   0   128M  0 part
zram0        252:0    0 970.7M  0 disk [SWAP]
zram1        252:1    0 970.7M  0 disk [SWAP]
zram2        252:2    0 970.7M  0 disk [SWAP]
zram3        252:3    0 970.7M  0 disk [SWAP]
nvme0n1      259:0    0 931.5G  0 disk
└─nvme0n1p1  259:2    0  41.9G  0 part
nvidia@nvidia-desktop:~$
```

10.3 BSP Flashing Procedure

After formatting, connect M.2 M-key NVMe device to J20 connector of Jackson ER board as shown below.



Remove HST jumper and insert DEV and RCVY jumpers on JP1 as shown below. Power on the board with recovery switch SW1 button pressed. Then release SW1 recovery switch button after few seconds.



Connect USB A to USB A cable between J29 port of Jackson ER board and Host PC installed with Ubuntu 20.4 x86_64, Kernel version: 5.15.0-52 or above.

Open the Linux terminal by pressing Ctrl+Alt+t in the Host PC and run '*lsusb'* command to verify whether the board is in recovery mode or not.

If board is booted in recovery mode, the Jetson Orin NX ™ will be detected as shown below.

```
hmecd001409@DSC:~$ lsusb
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 035: ID 0955:7323 NVIDIA Corp. APX
Bus 001 Device 123: ID 413c:2107 Dell Computer Corp. Dell USB Entry Keyboard
Bus 001 Device 124: ID 413c:301a Dell Computer Corp. Dell MS116 USB Optical Mous
e
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

Note: Similarly, the Jetson Orin Nano will be detected, but with different device ID. Refer below image for Orin NX and Orin Nano module's Device ID for different memory configuration.

- 7323 for Jetson Orin NX (P3767-0000 with 16GB)
- 7423 for Jetson Orin NX (P3767-0001 with 8GB)
- 7523 for Jetson Orin Nano (P3767-0003 and P3767-0005 with 8GB)
- 7623 for Jetson Orin Nano (P3767-0004 with 4GB)

Download the Jackson ER baseboard Image file 8512650_B_Jackson_BSP_Orn_Nano_NX_5.10.104_A64_L4TR35.3.1_V1.5.tar.gz file, from the FTP (File Transfer Protocol) site and copy it to the Linux Host Machine.

Open the Terminal and, type and execute the following command depicted in the Screen below to unzip the copied Image file. It may take a few minutes for the file to unzip.

$ sudo tar -pxvzf 8512650_B_Jackson_BSP_Orn_Nano_NX_5.10.104_A64_L4TR35.3.1_V1.5.tar.gz

Go to the extracted 'Linux_for_Tegra' folder on the terminal using 'cd' command. Refer below example for the same.

Eg: ***$ cd Linux_for_Tegra***

Run the following three commands one by one to flash the Jackson ER from the host PC.

$ sudo ./apply_binaries.sh

```
hmecd001409@DSC: ~/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra
hmecd001409@DSC:~/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra$ sudo ./apply_binaries.sh
[sudo] password for hmecd001409:
Using rootfs directory of: /home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/rootfs
Installing extlinux.conf into /boot/extlinux in target rootfs
/home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/nv_tegra/nv-apply-debs.sh
Root file system directory is /home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/rootfs
Copying public debian packages to rootfs
Skipping installation of nvidia-l4t-dgpu-apt-source_35.3.1-20230319081403_arm64.deb ....
Skipping installation of nvidia-l4t-dgpu-config_35.3.1-20230319081403_arm64.deb ....
Start L4T BSP package installation
QEMU binary is not available, looking for QEMU from host system
Found /usr/bin/qemu-aarch64-static
Installing QEMU binary in rootfs
/home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/rootfs /home/hmecd001409/BSP/Jackson/temp_fl
ash_dir/BSP_flashBinary/Linux_for_Tegra
Installing BSP Debian packages in /home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/rootfs
(Reading database ... 147140 files and directories currently installed.)
Preparing to unpack .../nvidia-l4t-core_35.3.1-20230319081403_arm64.deb ...
```

$ sudo ./tools/l4t_flash_prerequisites.sh

```
hmecd001409@DSC:~/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra$ sudo ./tools/l4t_flash_prerequisites.sh
Hit:1 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [274 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [414 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-backports/main amd64 DEP-11 Metadata [7,976 B]
Get:9 http://in.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [30.5 kB]
Get:10 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [2,535 kB]
Get:11 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [59.9 kB]
Get:12 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [13.2 kB]
Get:13 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [894 kB]
Get:14 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [96.7 kB]
Get:15 http://security.ubuntu.com/ubuntu focal-security/universe amd64 c-n-f Metadata [19.2 kB]
Get:16 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [940 B]
Fetched 4,683 kB in 9s (534 kB/s)
Reading package lists... Done
```

$ sudo ./tools/kernel_flash/l4t_initrd_flash.sh --external-device nvme0n1p1 -c tools/kernel_flash/flash_l4t_external.xml -p "-c bootloader/t186ref/cfg/flash_t234_qspi.xml" --showlogs --network usb0 jetson-orin-nano-devkit internal

```
hmecd001409@DSC:~/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra$ sudo ./tools/kernel_flash/l4t_initrd_flash.
sh --external-device nvme0n1p1 -c tools/kernel_flash/flash_l4t_external.xml -p "-c bootloader/t186ref/cfg/flash_t234_qspi
.xml" --showlogs --network usb0 jetson-orin-nano-devkit internal
[sudo] password for hmecd001409:
/home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/tools/kernel_flash/l4t_initrd_flash_internal
.sh --no-flash --external-device nvme0n1p1 -c tools/kernel_flash/flash_l4t_external.xml -p -c bootloader/t186ref/cfg/flas
h_t234_qspi.xml --showlogs --network usb0 jetson-orin-nano-devkit internal
***********************************
*                                 *
*  Step 1: Generate flash packages *
*                                 *
***********************************
Create folder to store images to flash
Generate image for internal storage devices
Generate images to be flashed
ADDITIONAL_DTB_OVERLAY=""   /home/hmecd001409/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra/flash.sh --no-fla
sh --sign  -c bootloader/t186ref/cfg/flash_t234_qspi.xml jetson-orin-nano-devkit internal

################################################################################
# L4T BSP Information:
# R35 , REVISION: 3.1
# User release: 0.0
################################################################################
```

The flashing process will take around 30 minutes to complete and below logs will pop up upon completion.

```
tar: Read checkpoint 740000
tar: Read checkpoint 750000
tar: Read checkpoint 760000
writing item=16, 9:0:secondary_gpt, 61203267072, 16896, gpt_secondary_9_0.bin, 16896, fixed-<reserved>-0, 4f2267eb43f021e
6718b1e41f8c762d215b42b64
[ 418]: l4t_flash_from_kernel: Successfully flash the external device
[ 418]: l4t_flash_from_kernel: Flashing success
[ 418]: l4t_flash_from_kernel: The device size indicated in the partition layout xml is smaller than the actual size. Thi
s utility will try to fix the GPT.
Flash is successful
Reboot device
Cleaning up...
Log is saved to Linux_for_Tegra/initrdlog/flash_1-5_0_20231030-133523.log
hmecd001409@DSC:~/BSP/Jackson/temp_flash_dir/BSP_flashBinary/Linux_for_Tegra$
```

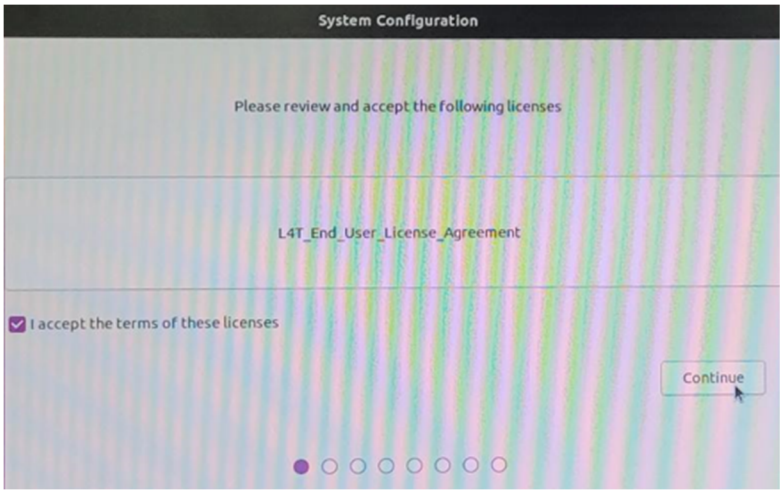
NOTE: Do not interrupt or interfere with the USB connectivity or the power supply to system board until the flashing procedure is complete.

Once the flashing is completed, the module will automatically reboot.

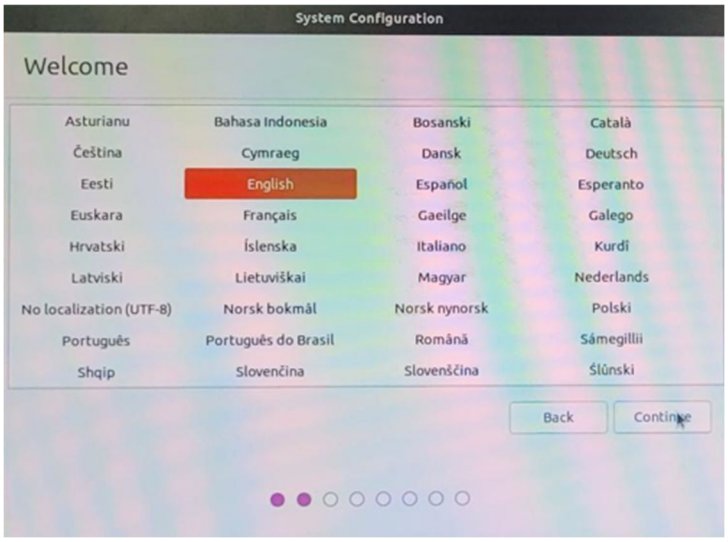
After rebooting, remove the USB cable at J29 port and connect HDMI cable.

10.4 Initial Configuration

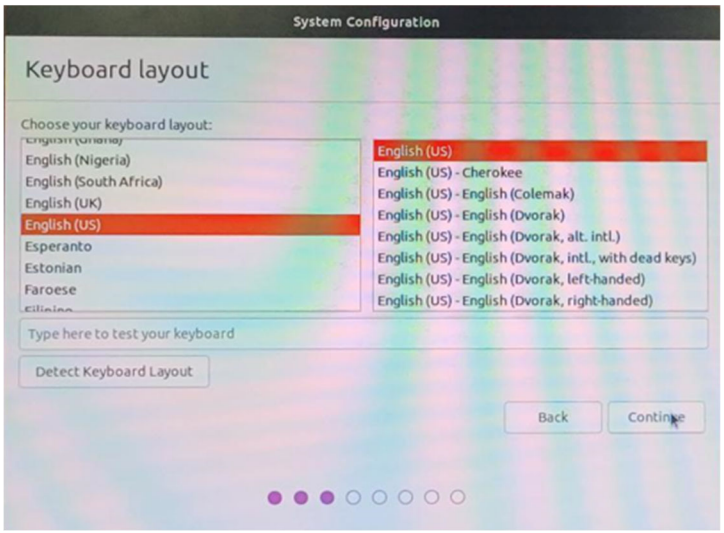
In the HDMI display system configuration window will appear.
Accept the license and click on continue.



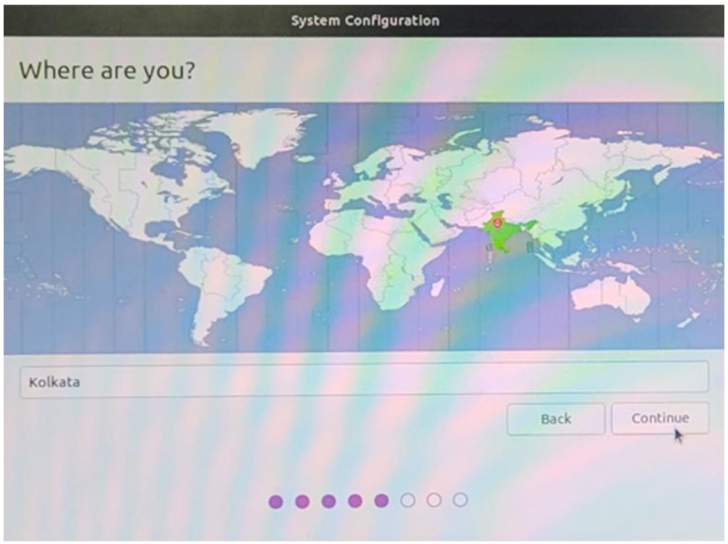
Select English and click on continue as shown below.



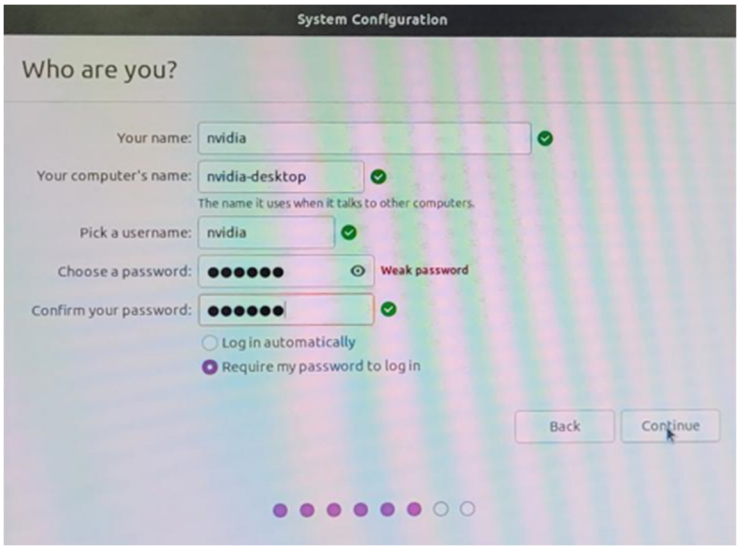
Select English (US) for Keyboard layout and click on continue.



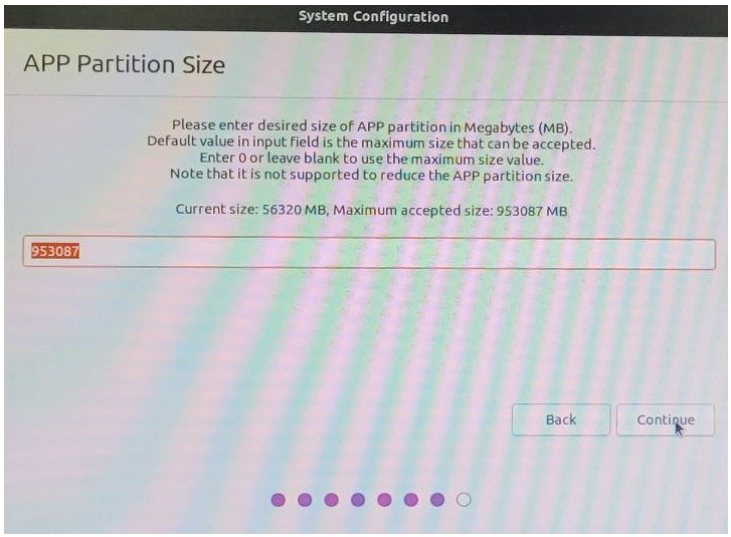
Click on your location on the map and select continue.



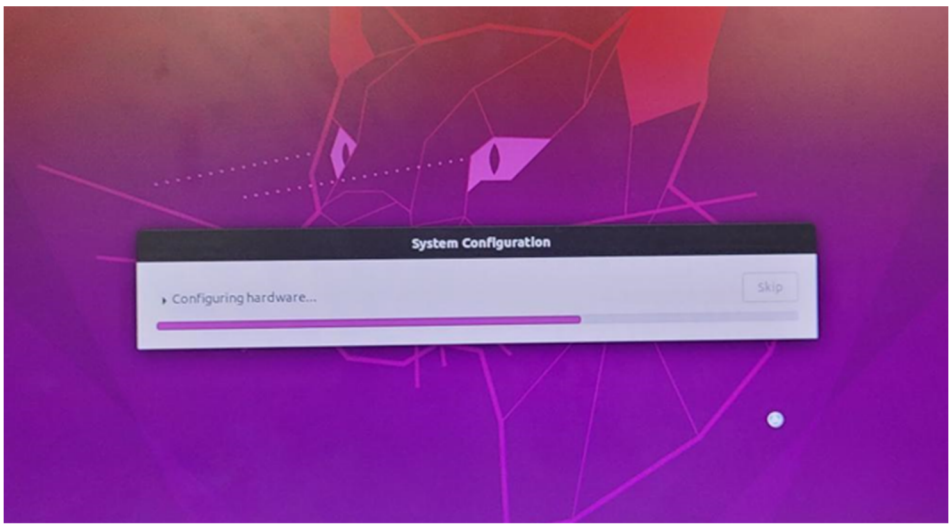
Fill the details as mentioned in below image and set the username and password as ‘nvidia’ and click on continue.



Click on continue without any edit for APP Partition Size.



Wait until Configuring hardware is complete.



Once the System configuration is done, the board will reboot. After rebooting, login with username and password as set in the previous steps.

10.5 Procedure to convert USB0 as host port

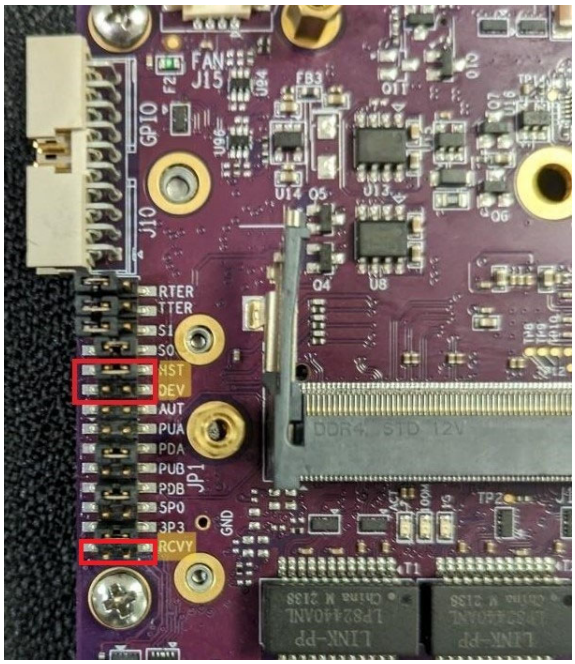
To convert USB0 as host device, execute the commands below and reboot to apply changes.

Open the terminal and run the command 'sudo otg_host'.

```
nvidia@nvidia-desktop:~$ sudo otg_host
[sudo] password for nvidia:
found kernel_tegra234-p3767-0000-p3768-0000-a0.dtb
kernel_tegra234-p3767-0000-p3768-0000-a0
<stdout>: Warning (label_is_string): /gpio@2200000/camera-control-output-low:lab
el: property is not a string
<stdout>: Warning (label_is_string): /gpio@6000d000/camera-control-output-low:la
bel: property is not a string
<stdout>: Warning (reg_format): /interrupt-controller@f400000/v2m@f410000:reg: p
roperty has invalid length (32 bytes) (#address-cells == 2, #size-cells == 1)
<stdout>: Warning (ranges_format): /interrupt-controller@f400000:ranges: empty "
```

Power off the board.

Remove DEV and RCVY jumpers and insert HST jumper on JP1.



Connect the USB mouse to J29 port and power on the board. Check whether USB mouse is working.

Power off the board.

11 SYSTEM ASSEMBLY

11.1 Installing Orin Nano/ Orin NX Module

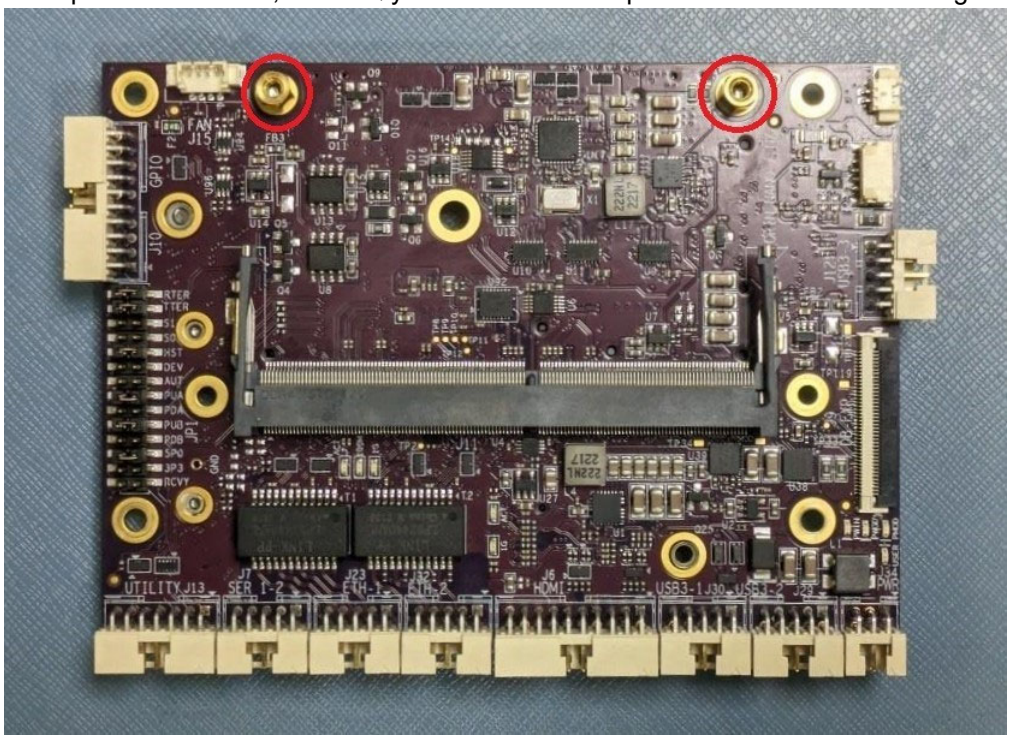
This section describes the steps to install Orin Nano/ Orin NX module on the Jackson ER base board.

11.1.1 Required Accessories

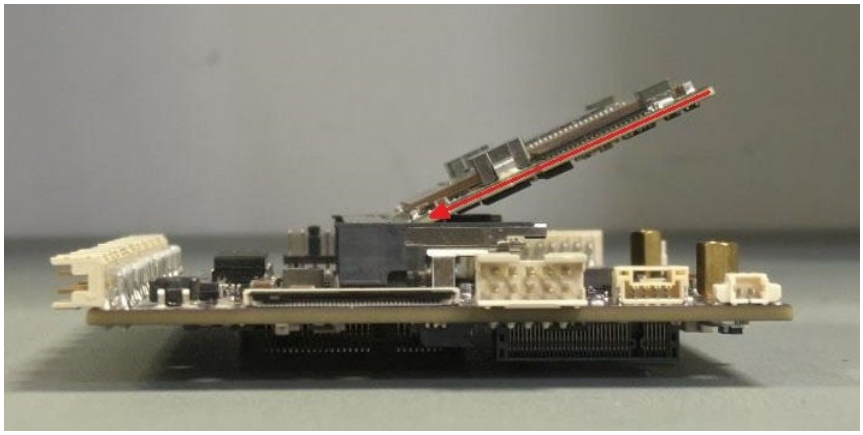
Item	DSC Part No.	Description
1		M2.5 x 10 Pan head Phillips screw #92000A1006
2	4810010	Fan, 30x30mm 6.9mmH, 5V 4-Wire
3	6882660	Jackson ER Heat spreader kit
5	8882286	Jetson Orin NX Module
6	6848065	Spacer, M2.5 x 6.5mmL Hex F/F Brass Nickel Plated
7	6810305	Screw, M2.5-.5X4mm, Pan head Phillips

11.1.2 Assembly Instructions

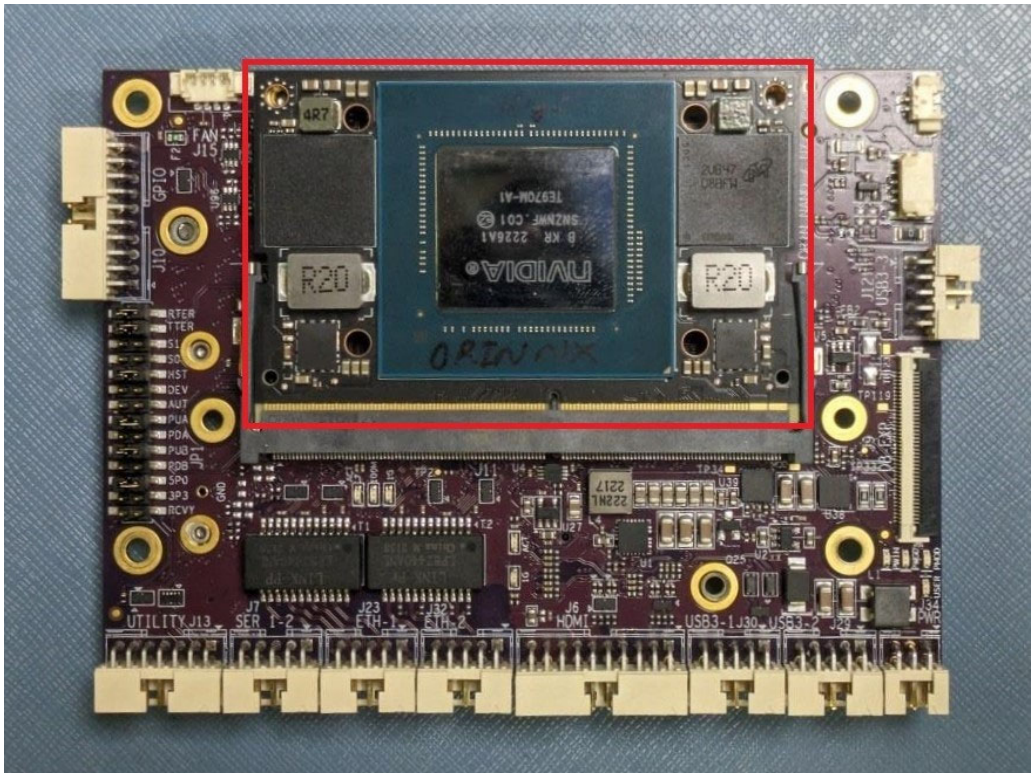
If not present on board, install Qty 2 DSC 6848065 Spacer M2.5 6.5mm F/F along board edge as highlighted.



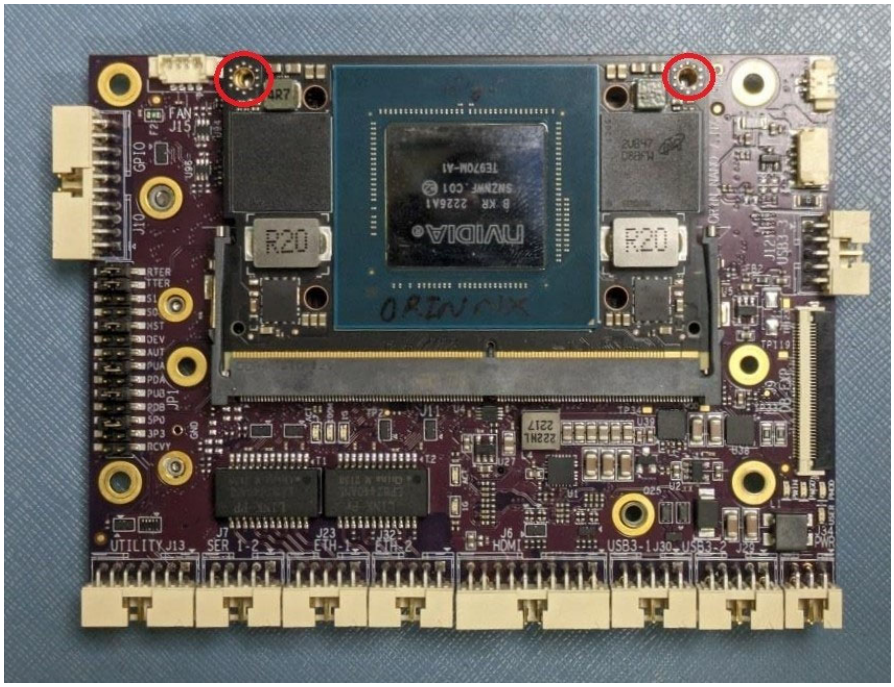
Insert module into socket at 45-degree angle.



Push down module so that both side latches click fully into position. You may need to push down on the module PCB and push in the latches because it is a tight fit.

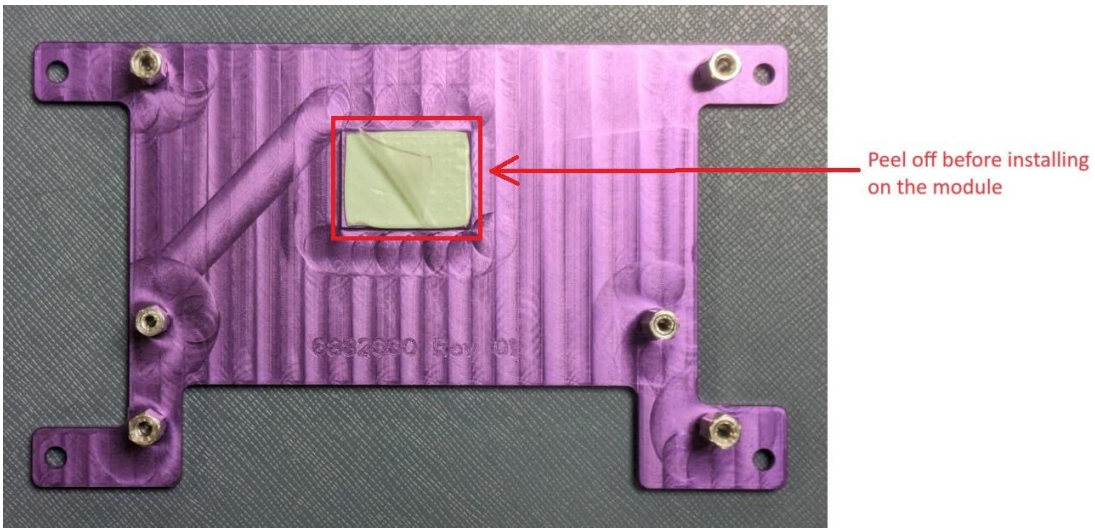


View of installed Jetson module

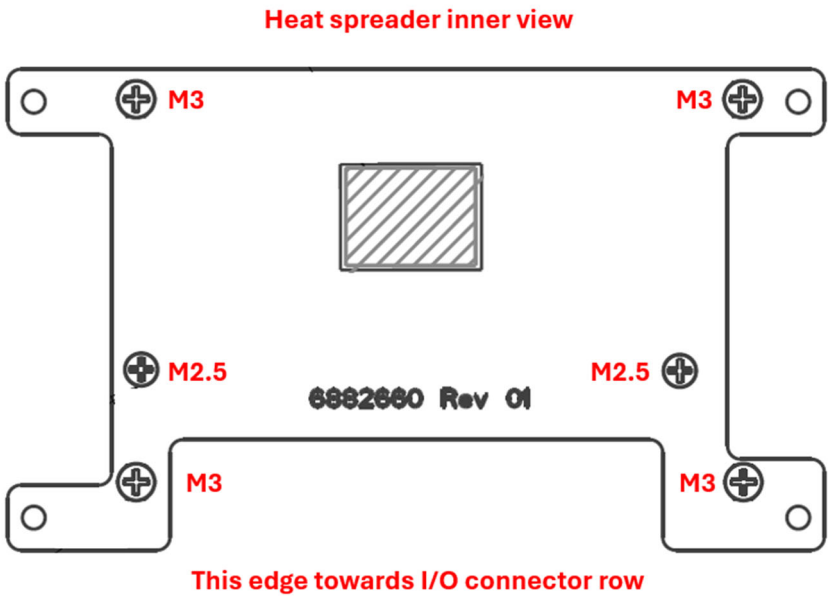


Now remove the outer liner from the thermal pad on the inner surface of the heat spreader. This liner is for protection of the thermal pad during handling and must be removed to ensure proper thermal transfer.

If the outer liner is not removed, the thermal performance of the heat sink will be greatly reduced. This is a common oversight.

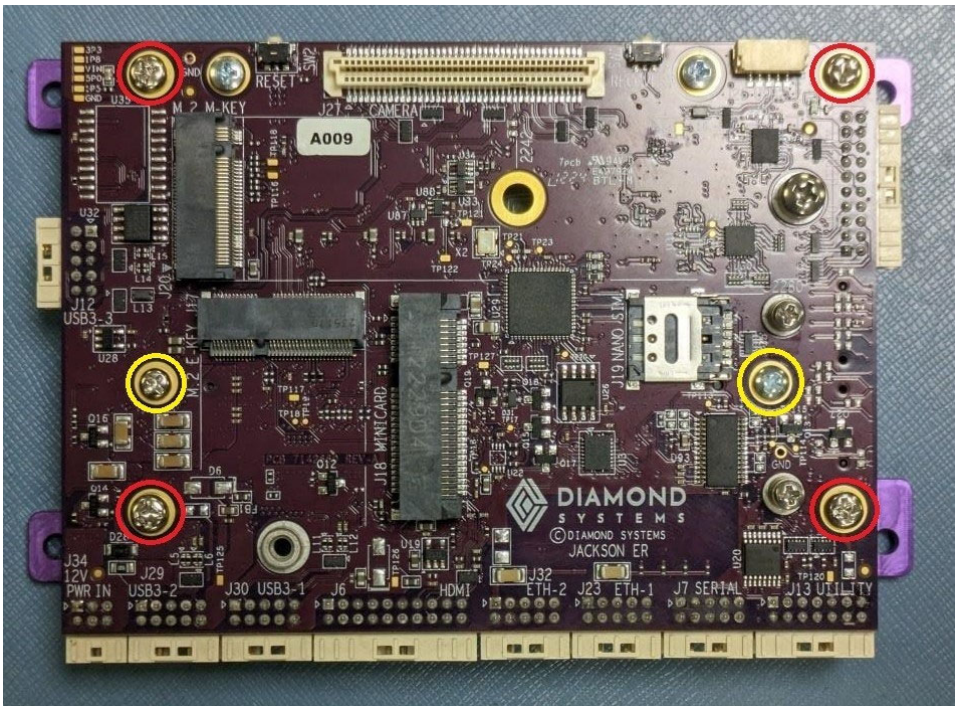


Install standoffs from heat spreader kit as indicated in the illustration below.



Place heat spreader over the carrier + module assembly, aligning the heat spreader over the 6 stand on the heatsink. Press down gently to provide contact between the thermal pad and the Jetson module processor, which will help hold the heat spreader in place for screw insertion.

Install 4 qty M3 x 6mm screws through the mounting holes into the spacers on the four corners of the heatsink. Then install qty 2 M2.5 x 6mm screws into the other two spacers through the mounting holes. It is recommended to install all 6 screws loosely to ensure proper alignment, then tighten all 6 screws.



12 HEAT SPREADER

The Jackson-ER heat spreader (DSC part no. 6882660) combines efficient thermal dissipation with convenient mounting holes. It is designed to bolt directly to the metal wall of an enclosure to transfer heat from the Orin processor chip to the enclosure. Direct to metal heat transfer is significantly more efficient than transferring to air via a traditional heat sink, avoids the need for a mechanical fan, and reduces the internal temperature of the enclosure, helping to improve overall reliability and MTBF.

The outer surface of the heat spreader contains a matrix of thermal pads to provide improved heat transfer to the enclosure wall compared to bare metal to metal contact.

With the heat spreader installed, Jackson-ER is mounted in the enclosure upside down from the traditional carrier board configuration where the module is on the top side.

The heat spreader is not included with the base model JAXER-BB01 but is available for separate purchase as an accessory. It is included in the Jackson-ER system assemblies with part numbers ending in -HSP.

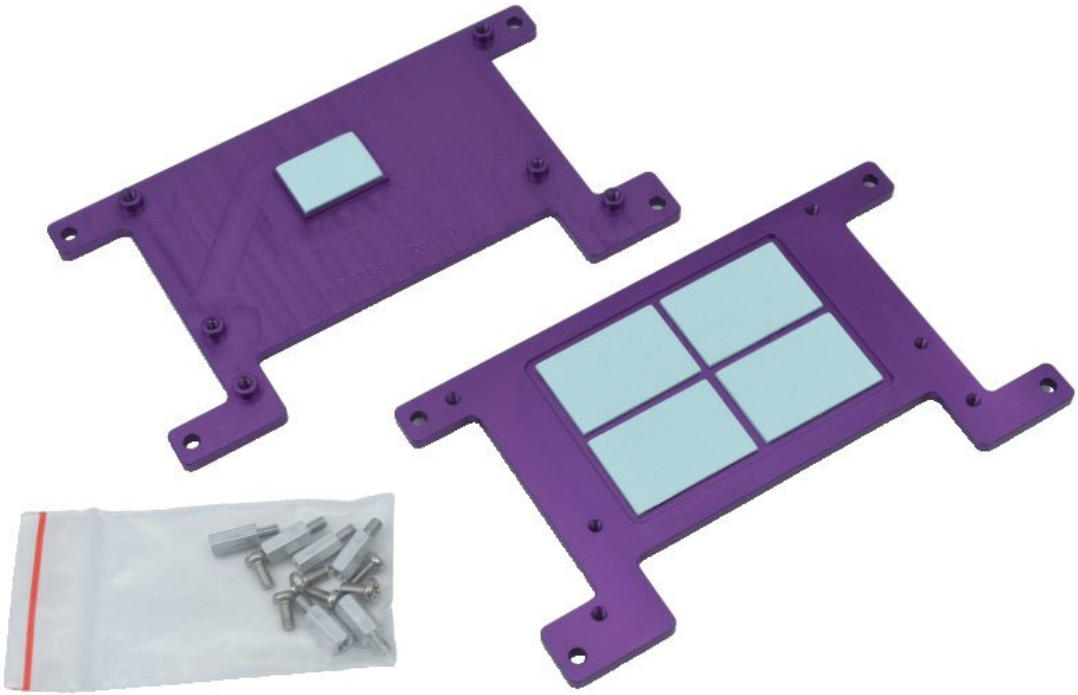


Figure 12-1: Heat spreader kit (DSC part no. 6882660)

Heat Spreader Kit Contents

Qty	Description
1	Heat spreader base unit with thermal pads pre-attached on inner and outer surfaces
2	M2.5 x 10mm long M/F standoffs
4	M3 x 10mm long M/F standoffs
2	M2.5 x 6mm long Phillips pan head screws
4	M3 x 6mm long Phillips pan head screws

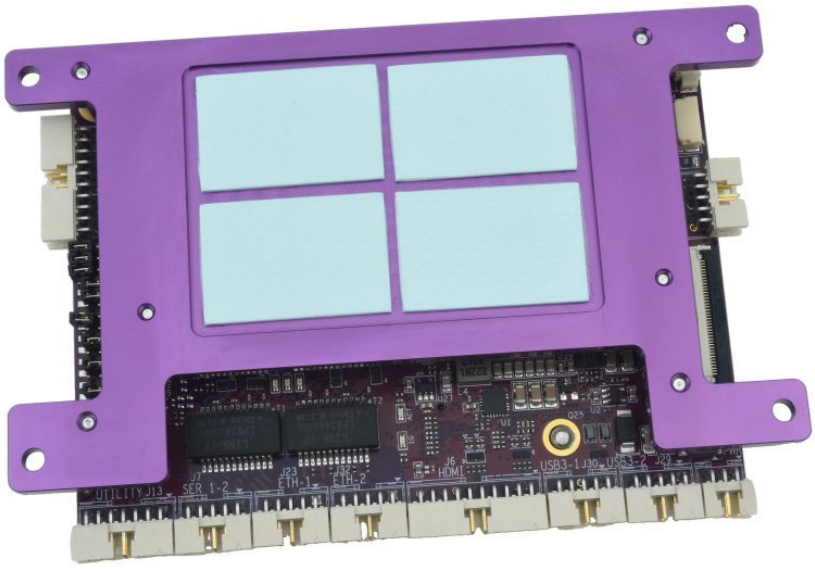


Figure 12-2: Bottom view of Jackson-ER with heat spreader installed

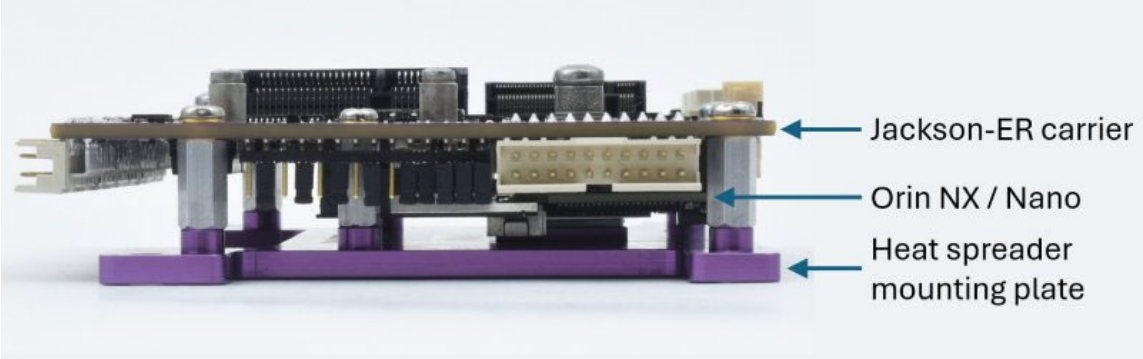


Figure 12-3: Side view of Jackson-ER with heat spreader installed

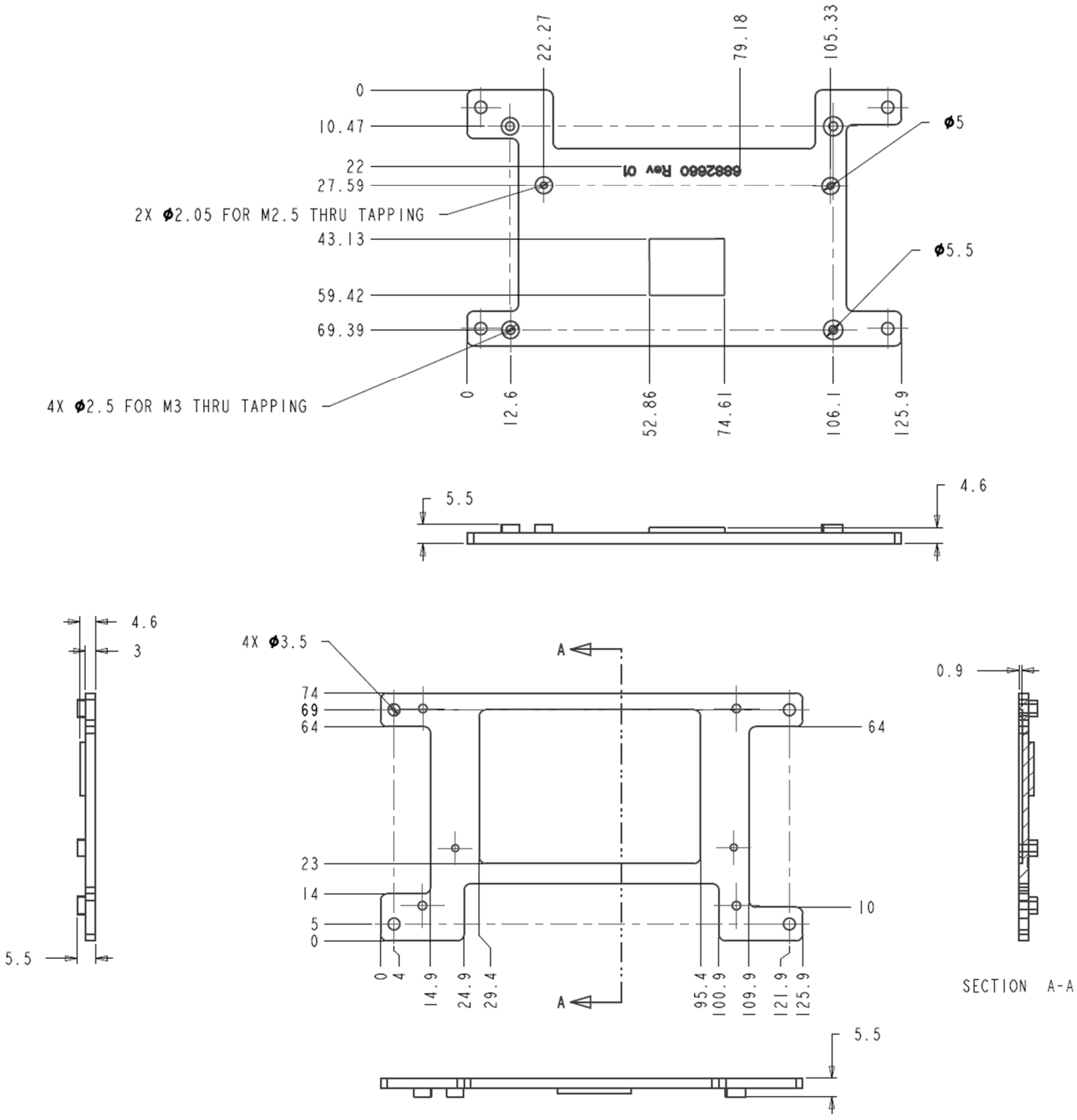


Figure 12-4: Jackson-ER heat spreader dimension drawing

13 HEAT SINK

A heat sink and fan sink are also available for applications desiring that type of thermal solution. These accessories are available for purchase separately from the Jackson-ER carrier board. They are included in the system assemblies with part numbers ending in -HSK.

Figure 13-1: Heat sink (DSC part no. 6882650)

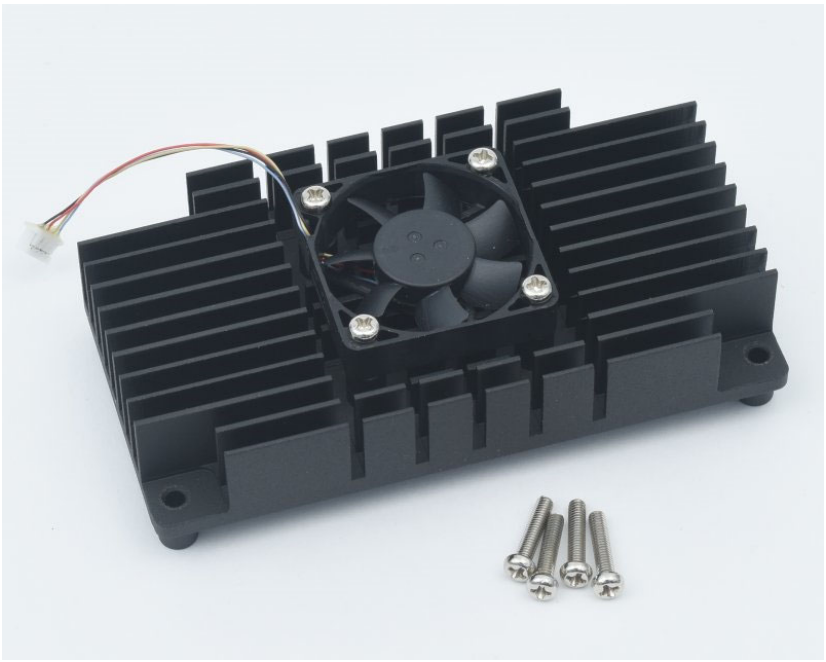


Figure 13-2: Fan sink (DSC part no. 6882651)

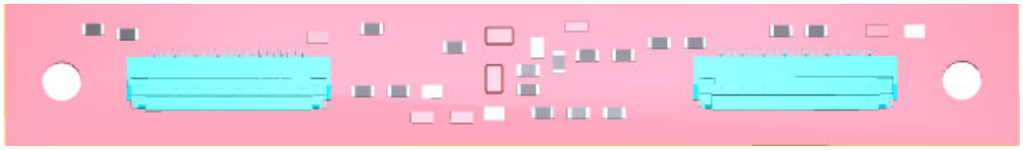
14 CAMERA ADAPTER BOARD

This section may be updated regularly based on newly introduced adapter boards. The information provided here is current only as of the date of this manual's publication Contact Diamond Systems for the latest information or to arrange for a custom camera adapter board.

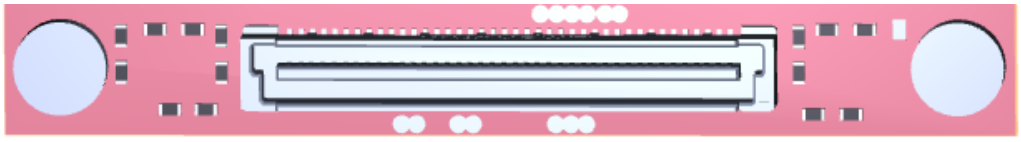
14.1 e-con camera adapter board

This adapter supports two e-con dual-lane CSI cameras. It can also be used with any other CSI cameras that support the same pinout as mentioned in the table below.

1	V_3P3
2	CAM1_I2C_SDA_3P3
3	CAM1_I2C_SCL_3P3
4	GND_DIG
5	CAM0_MCLK_3P3
6	CAM0_PWDN_3P3
7	GND_DIG
8	CSI0_D3_P
9	CSI0_D3_N
10	GND_DIG
11	CSI0_D2_P
12	CSI0_D2_N
13	GND_DIG
14	CSI0_CLK_P
15	CSI0_CLK_N
16	GND_DIG
17	CSI0_D1_P
18	CSI0_D1_N
19	GND_DIG
20	CSI0_D0_P
21	CSI0_D0_N
22	GND_DIG



Top View with two camera connectors (J5 and J6)



Bottom View with B2B connector (J2)

14.2 Allied Vision camera adapter board

This adapter supports two Allied vision dual-lane CSI cameras. It can also be used with any other CSI cameras that support same pinout as mentioned in below table.

1	GND_AL
2	AL_CSI0_D0_P
3	AL_CSI0_D0_N
4	GND_AL
5	AL_CSI0_D1_P
6	AL_CSI0_D1_N
7	GND_AL
8	AL_CSI0_CLK_P
9	AL_CSI0_CLK_N
10	GND_AL
11	AL_CSI0_D2_P
12	AL_CSI0_D2_N
13	GND_AL
14	AL_CSI0_D3_P
15	AL_CSI0_D3_N
16	V_5P0_AL
17	AL_CAM_GPIO2_3P3
18	AL_CAM_GPIO1_3P3
19	V_5P0_AL
20	AL_CAM1_I2C_SDA_3P3
21	AL_CAM1_I2C_SCL_3P3
22	V_5P0_AL

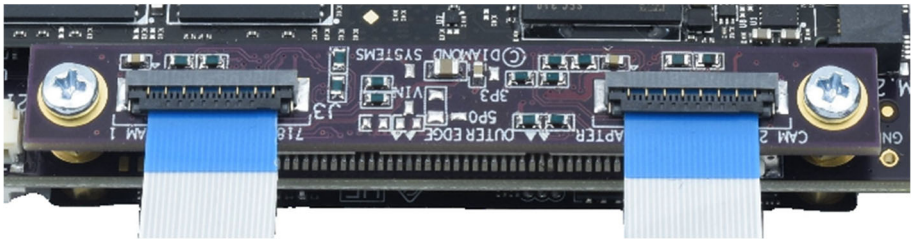
Top View with two camera connectors (J3 and J4)

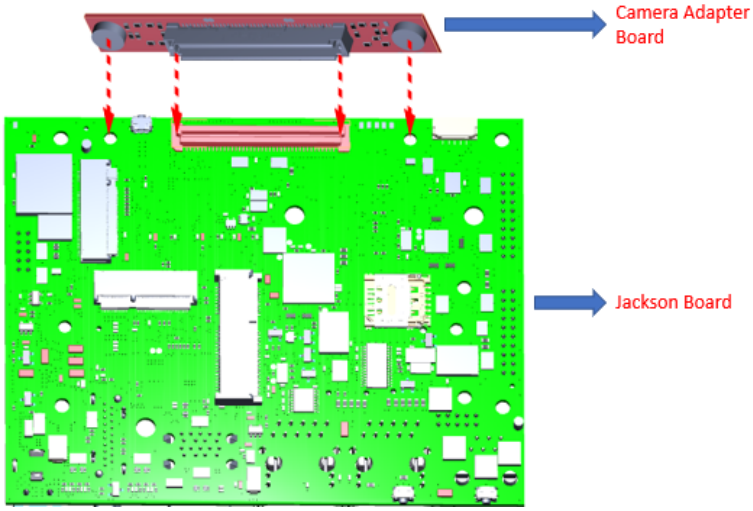
Bottom View with B2B connector (J1)

14.3 Camera Adapter Installation

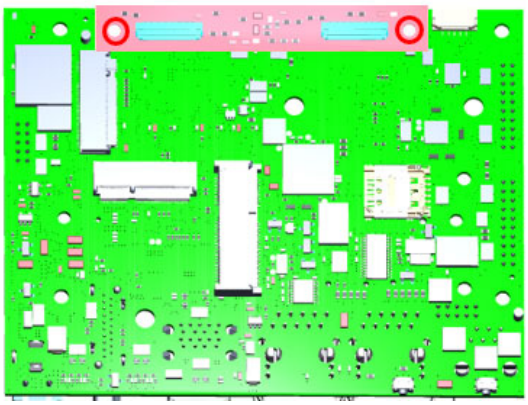
1. Connect Camera adapter board's B2B connector to connector J27 on the bottom side of Jackson ER.

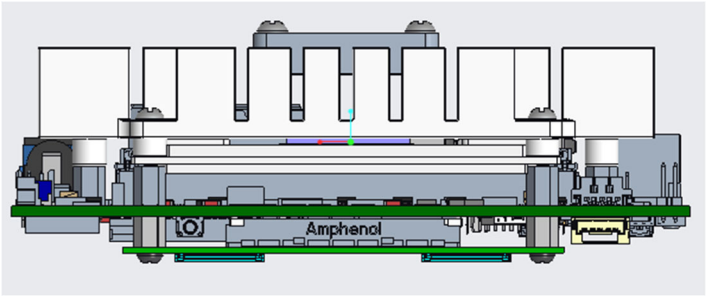
Be careful to maintain the correct orientation to avoid damaging one or both connectors! The adapter board has silkscreen marking indicating the side that faces the Jackson ER board edge.



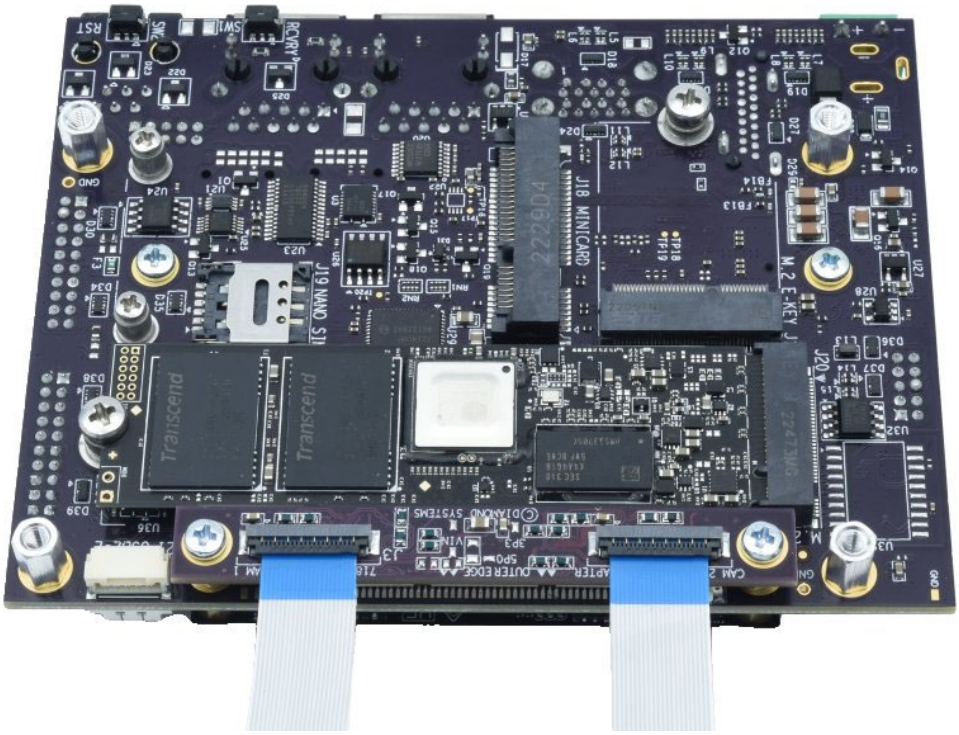


2. Install qty 2 M2.5 3mm screws (DSC no. 6811253) through the mounting holes of camera adapter board into the spacers on Jackson ER board as encircled in below image.





Side view of the assembled board.



Bottom view of the assembled board with FFC cables attached.

Note PCB edge indication on camera adapter silkscreen.

15 LIMITED WARRANTY

Unless otherwise agreed to in writing, Diamond Systems Corporation (DSC) warrants to the original purchaser that its products will be free from defects in material and workmanship for a period of time as indicated below:

DSC designed and built products	Two years from the date of shipment
Resale items	Warranty is passed through from the OEM; this applies to installed COMs, Nvidia Jetson modules, memory modules and similar items.

This warranty does not apply to products that have been misused, damaged in use, or altered.

DSC's obligation under this warranty is limited to replacement or repair, at its option. Any such product within the warranty period must be returned to DSC in DSC-approved packaging with a DSC-assigned Return Material Authorization (RMA) number referenced on the shipping document. Purchaser shall prepay transportation to DSC's designated site. If returned products are repaired or replaced under the terms of this warranty, DSC shall pay return transportation charges.

In cases where damage is determined to be caused by Customer, DSC may offer various paid repair or replacement options, depending on the nature of the damage and the feasibility of repair.

DSC IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, OR UNDER ANY OTHER LEGAL THEORY, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DOWNTIME, GOODWILL, DAMAGE TO OR REPLACEMENT OF EQUIPMENT AND PROPERTY, ANY COSTS OF RECOVERING, REPROGRAMMING, OR REPRODUCING ANY PROGRAM OR DATA STORED IN OR USED WITH DSC PRODUCTS, AND ANY FAILURE TO MAINTAIN THE CONFIDENTIALITY OF DATA STORED ON THE PRODUCT. DSC SPECIFICALLY DOES NOT REPRESENT THAT IT WILL BE ABLE TO REPAIR ANY PRODUCT UNDER THIS WARRANTY.